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datum inc.

Timing Instrumentation

INSTRUCTION MANUAL
MODEL 9300A
TIME CODE
GENERATOR/TRANSLATOR
PART NUMBER 9300-7368

DATUM INC., TIMING DIVISION

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MANUAL ADDENDUM

EQUIPMENT CONFIGURATION

The Model 9300 Time Code Generator/Translator (TCG/T) consists of a basic unit, to which optional features are added. Sections One through Five of this manual describe the basic 9300 TCG/T. Material pertaining to optional features is contained in Appendix B.

The Model 9300-7368 TCG/T contains the following optional features:

1. PARALLEL OUTPUTS (Assembly Number 16635-123)

These outputs consist of milliseconds, seconds, minutes, hours, and days BCD time data and are output on connector J4. Connector J4 also contains provisions for external translator control. (TAPE SEARCH)

a. See Table I (Appendix B) for pin assignments.
b. BCD outputs are ttl positive true logic.
c. Sample time pulse is normally true-pulsing to a Logic "0" (GND) for approximately 2 microseconds at update time (1K pps rate).
d. See Section III, paragraph 3.4.3, and Appendix B for Tape Search operation.

2. FAILSAFE/REGENERATE MUX (1:1 FORWARD)

This option provides for regeneration of the IRIG B Input code when operating as a Time Code Translator by providing an in phase 1KHz square wave for the Shaper Modulator when in the 1:1 mode of operation. Additionally, coninuity of outputs is provided should the input code be lost or fall below an adjustable threshold level.

a. See Drawing Number 19168 for logic.
b. See Appendix B for Theory of Operation.

3. 1PPS SYNC (J7 Rear Panel)

a. See Drawings 9300-8804 and 18299 for logic.
b. DC Pulse Input: TTL Compatible
c. On Time Edge: Positive Jumper C1-7 to POS
   Negative Jumper C1-7 to NEG
d. Operation: Connect reference signal to J7. Select on time sync edge per (3.C.) Compare 1PPS pulse rate from unit to reference signal for proper operation

NOTE: 1pps Sync is disabled when the failsafe switch is in the "in" position.

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SECTION ONE

GENERAL INFORMATION

1.1 INTRODUCTION

This manual describes the installation, operation and theory of operation of the Datum Model 9300 Time Code Generator/Translator (TCG/T).

The 9300 TCG/T consists of a basic assembly, coupled with optional features specified by the customer. Unless otherwise indicated, the main text of this manual is devoted to the basic assembly. Optional features are described in Appendix B.

1.2 GENERAL DESCRIPTION

The Model 9300 TCG/T performs two principle functions - translation and generation of serial time code signals of prescribed formats. Provisions are made for several optional features which may, or may not be directly related to the two principle functions.

1.2.1 Time Code Translation

When operating in the translation mode, the TCG/T deciphers a serial time code signal received from an external source. Although the standard configuration accommodates the IRIG B format, other time code formats can be translated on an optional basis. As a result of the translation process, the unit automatically displays the appropriate time value and produces a series of pulse rate signals in sync with the translated code.

An error frame bypass feature permits a pre-selected number of code frames exhibiting errors to be bypassed before the internal accumulators are updated to reflect the translated time value. This provides a form of noise rejection by permitting the operator to designate a certain number of frames as being invalid.

1.2.2 Time Code Generation

Selection of the generation mode causes the TCG/T to develop a serial time code (IRIG B in the standard configuration) signal based on internally accumulated time information. Front panel controls permit the internal clock to be started, stopped or preset. Each time digit can be individually set to any value within its normal range.

1.3 PHYSICAL CONFIGURATION

The Model 9300 TCG/T (Figure 1-1) is entirely self contained and is designed for mounting in a standard 19-inch RETMA rack. Controls and indicators are mounted on the front panel, and interface connectors are located at the rear of the unit. All electrical components are mounted on p.c. boards within the chassis. The p.c. boards, as well as the modular power supply, are supported over their entire lengths by aluminium extrusion. The time display is composed of nine LED elements mounted along the front edge of the basic electronics board.

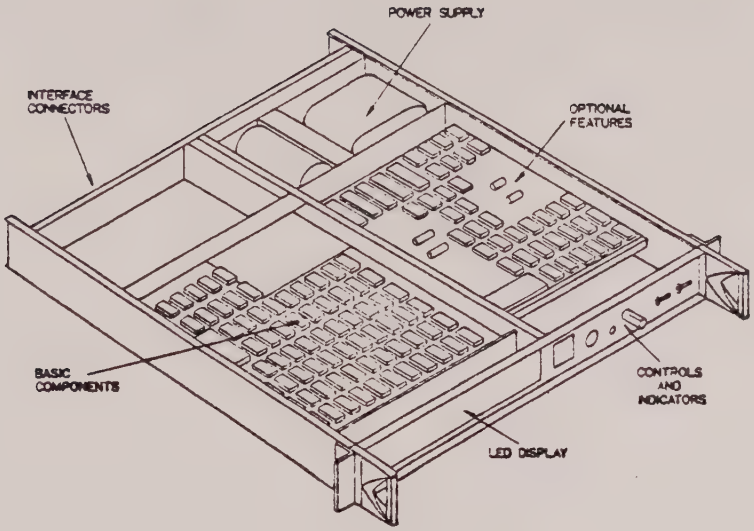


Figure 1-1. Model 9300 TCG/T Physical Configuration (Typical).

1.4 SPECIFICATIONS

Specifications for the Model 9300 TCG/T are listed in Table 1-1.

Table 1-1. Model 9300 TCG/T Specifications

Item	Connector	Specification	
INPUTS			
Power	J6	115/230 VAC ±10% 48 to 420 Hz	
Time Code	J1	Format:	IRIG B BCD time of Year (B122). (Control functions and straight binary seconds may be included in the time code but are not recognized as valid data in the standard instrument.)
		Frequency:	1 kHz
		Ratio:	2:1 - 6:1
		Amplitude:	100 MV p-p to 10V p-p on the mark pulse.
		Input Impedance:	100 K ohm minimum

Table 1-1. Model 9300 TCG/T Specifications (Continued)

Item	Connector	Specification
		Frequency Range: 10 Hz - 300 kHz
		Synchronization Accuracy: Less than ±50 microseconds
OUTPUTS		
IRIG B:	J2	BCD Time of Year (B122)
		NOTE This output is available only when GEN mode is selected.
		Carrier Frequency: 1-kHz sinewave
		Amplitude: Adjustable from 0 to 10V p-p on mark pulse.
		Modulation Ratio: Adjustable from 2:1 through 4:1
		External Load: ≥ 600ohms
Standard Pulse Rates	J3	Rates: 1K pps Pin 1 100 pps Pin 2 10 pps Pin 3 1 pps Pin 4 GND
		Duty Cycle: 80/20% 1K pps: 50/50% (In translator mode) On Time Edge: Negative Output Levels: Logic "0" ≤ 0.4 VDC Logic "1" ≥ 2.4 VDC Source Impedance: DTL/TTL Compatible
TIME BASE		
		Type: Crystal Controlled Oscillator Frequency: 1 MHz Stability: ±5 X 10-6
ENVIRONMENT		
		Temperature: 0°C to +50°C Humidity: Up to 95% relative
PHYSICAL		
		Panel Height: 1-3/4 inches Chassis Width: 17 inches Chassis Depth: 18 inches

SECTION TWO

INSTALLATION AND OPERATION

2.1 INSTALLATION

Installation of the Model 9300 TCG/T consists of mounting the unit in a suitable equipment rack, connecting interface cables, and applying the appropriate power. No preliminary adjustments are normally required prior to installation of a basic unit, since all internal settings are performed at the factory. Certain options, such as the propagation delay feature, may require initial setup adjustments; these are described in Appendix B.

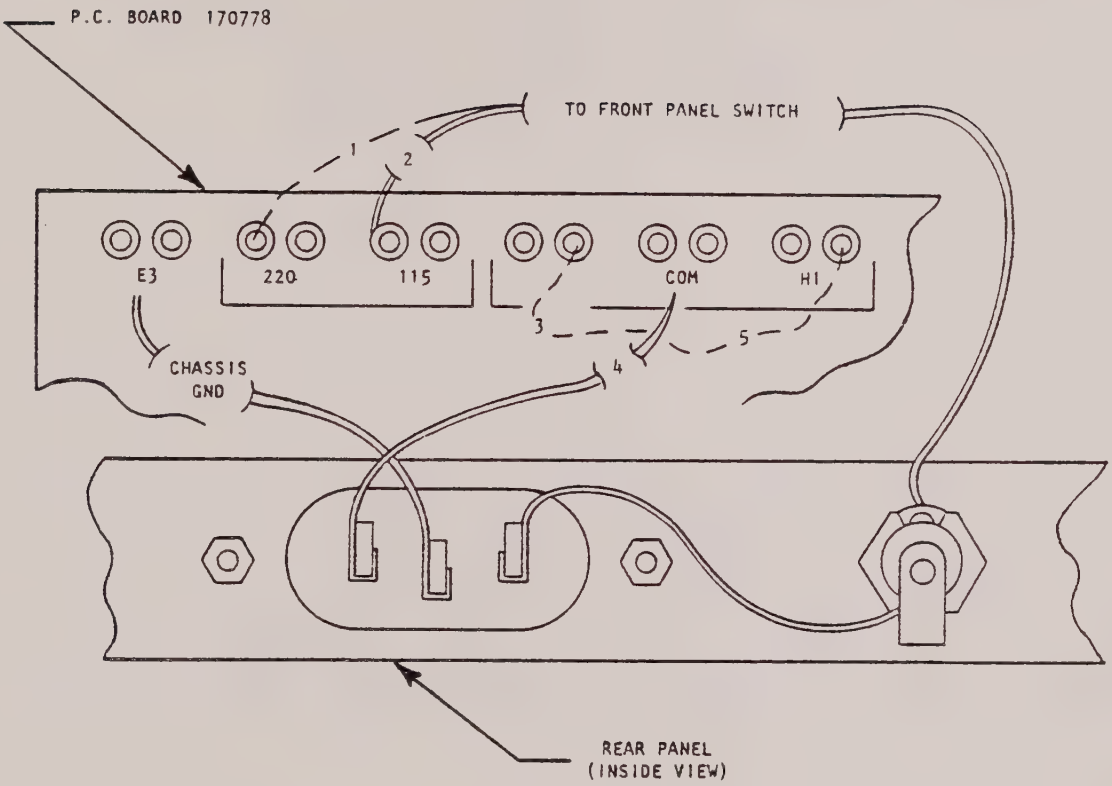
WARNING

Hazardous voltage levels exist in this equipment when power is applied. Exercise extreme caution when protective covers are removed.

Interface signal and primary power characteristics are defined in Table 1-1. Connector pin assignments are listed on the drawings in Section Six.

NOTE

When shipped from the factory, the 9300 TCG/T is normally configured for operation with 115-vac primary power. To alter the unit for 220/230-vac operation, see Figure 2-1.



1.	Jumper #1	For 220 VAC Operation
2.	Jumper #2	For 115 VAC Operation
3.	Jumper #3	For Lo Line Voltage
4.	Jumper #4	For Normal Line Voltage
5.	Jumper #5	For Hi Line Voltage

Figure 2-1. Power Supply Connections

2.2 OPERATION

The principle functions (translation and generation) of the TCG/T are performed automatically after certain setup procedures are accomplished. These procedures are determined by the selected operating mode, or by the requirements of a specific option. Controls and indicators are shown in Figure 2-2; their functions are described in Table 2-1.

NOTE

Operating instructions for optional features are contained in Appendix B.

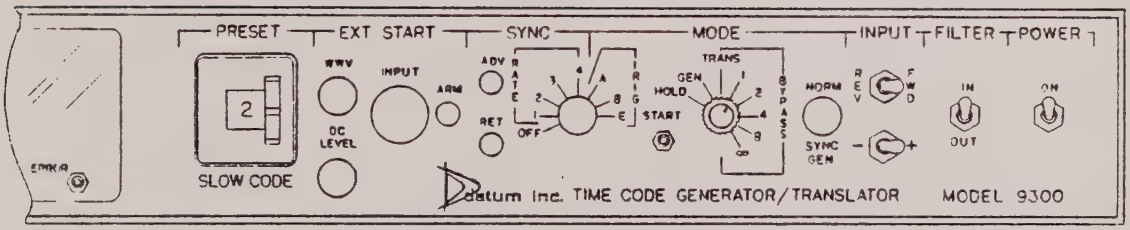


Figure 2-2. Controls and Indicators

Table 2-1. Control and Indicator Functions

Control and Indicator	Function
LED Display	1. Time Display - Nine digits (day, hours, minutes, seconds) reflecting generated or translated time value. 2. ERROR Status - Illuminates during Translate mode.
Time digit pushbutton switches	Activation of each switch sets its respective time digit to value selected by PRESET thumbwheel switch. Used to preset time value during Hold mode.
PRESET thumbwheel switch	Selects preset value for each time digit.
MODE switch	Selects operating mode (Generate or Translate) and error frame bypass value (Hold).
START switch	Activates time code generation when Generate mode is selected after leaving Hold mode.
INPUT FWD/REV switch	Conditions unit to translate code received in either forward or reverse direction.
INPUT +/- switch	Conditions unit to translate code signal of normal (+) or inverted (-) polairity.
FILTER switch	Activates 3-kHz input filter during Translate mode.
POWER switch	Activates primary power.

2.2.1 Generate Mode

a. Activate PWR switch to apply primary power.

b. Set MODE switch to HOLD position. Verify that display is stationary.

c. Preset time-of-day value as follows:

NOTE

When presetting time value, always begin with least-significant digit (units of seconds).

1. Use PRESET thumbwheel switch to select desired value of first digit.

2. Press pushbutton switch beneath first digit in display. Verify that display reflects value selected in step 1.

3. Repeat steps 1 and 2 for remaining digits.

d. Set MODE switch to GEN position. Activate generator by pressing START switch at appropriate time.

2.2.2 Translate Mode

a. Activate PWR switch to apply primary power.

b. Set MODE switch to HOLD position. Verify that display is stationary.

c. Apply 1-kHz modulated IRIG B time code signal to connector J1. Signal must comply with specifications listed in Table 1-1.

NOTE

Optional segments of IRIG B code (control functions and straight binary seconds data) are not processed during translation mode. Their presence or absence has no effect on TCG/T operation.

d. Set MODE switch to TRANS position.

e. Set FWD/REV switch to FWD position. Code synchronization and translation will commence after a delay of approximately 60 seconds.

2.2.3 Error Frame Bypass Operation

The error frame bypass feature is functionally a part of the Translate mode, and is controlled by the MODE switch. A frame bypass ERROR indicator is located next to the unit-seconds digit in the LED display.

When the MODE switch is set to TRANS, the 9300 translates each frame of the incoming code and displays the appropriate value. Any inaccuracies within the code will be reflected by the instrument.

Erroneous readings due to input signal degradation can be avoided by setting the MODE switch to BYPASS 1, 2, 4 or 8. This provides an effective means of input signal noise rejection by permitting the internal counters to be loaded with an updated time value only after 1, 2, 4 or 8 consecutive code frames exhibiting errors are detected. If errors are not encountered in the selected number of consecutive frames, the counters simply operate as accumulators, and are clocked by the carrier component of the modulated time code signal. Setting the MODE switch to BYPASS - INFINITY causes the unit to function as an elapsed-time generator; the internal counters are never updated to conform to the time value in the code.

The ERROR signal illuminates whenever the incoming code and the internal counters reflect different time values.

2.2.4 Input Code Direction

The 9300 TCG/T can be programmed to translate time code signals received in either the forward or reverse directions (typically occurring in tape search operations). On the basic unit, this feature is controlled manually by setting the INPUT - FWD/REV switch to the proper position. The FWD position selects forward translation; REV specifies reverse translation.

When the parallel output option is included in the instrument, remote control via a TTL-compatible input line permits an external device to define the FWD/REV function.

2.2.5 Input Code Polarity

Input time code signals of normal or inverted polarity can be accommodated by the TCG/T in Translation mode. This function is selected by the INPUT +/- switch. Set the switch to "+" for normal polarity, and "-" for inverted polarity.

2.2.6 Input Filter Selection

An internal 3-kHz low-pass filter is included for use in tape playback operations (X1 speed ratio). To activate the filter, set the FILTER IN/OUT switch to the IN position.

When the parallel output option is cincluded, remote control via a TTL-compatible input line (SEARCH) permits an external device to perform filter selection.

SECTION THREE

THEORY OF OPERATION

3.1 INTRODUCTION

This section directed the theory of operation of the basic Model 9300 Time Code Generator/Translator (TCG/T). The instrument will be described in both general and specific terms, using block diagrams and engineering drawings for reference. Optional features are described in Appendix B.

The level of explanation is described to the experienced technician familiar with digital electronics techniques in general, and timing instrumentation specifically.

3.2 DRAWING STRUCTURE

This instrument is designed for modular construction, and the engineering drawings in Section Six are organized accordingly. Generally, each major element of the TCG/T is shown on an individual drawing. Those drawings containing logic circuitry that is referenced within this manual are provided with encircled number in their respective title blocks. These numbers will be employed in the description rather than specific assembly or schematic drawing numbers. Reference numbers will be either encircled or enclosed in parenthesis.

Encircled numbers are also used in the drawings to signify logic signal origin and destination. These designations also refer to encircled numbers in the title blocks of specific drawings.

3.3 GENERAL DESCRIPTION

The basic 9300 TCG/T contains all the elements necessary to generate and translate the IRIG B time code. A block diagram illustrating the basic elements of the unit is shown in Figure 3-1. The encircled numbers appearing in the blocks correspond to encircled numbers in the title blocks of the logic drawings in Section Six.

For the purpose of this description, the internal components will be classified in the following three categories:

1. Central components - elements in this category include the minor and major time counters, mode control logic, display drivers and LED display, switch and control network and power supply.

2. Code generation components - this circuitry is dedicated to generation of the IRIG B time code, and consists of the IRIG B encoder and its associated output modulator.

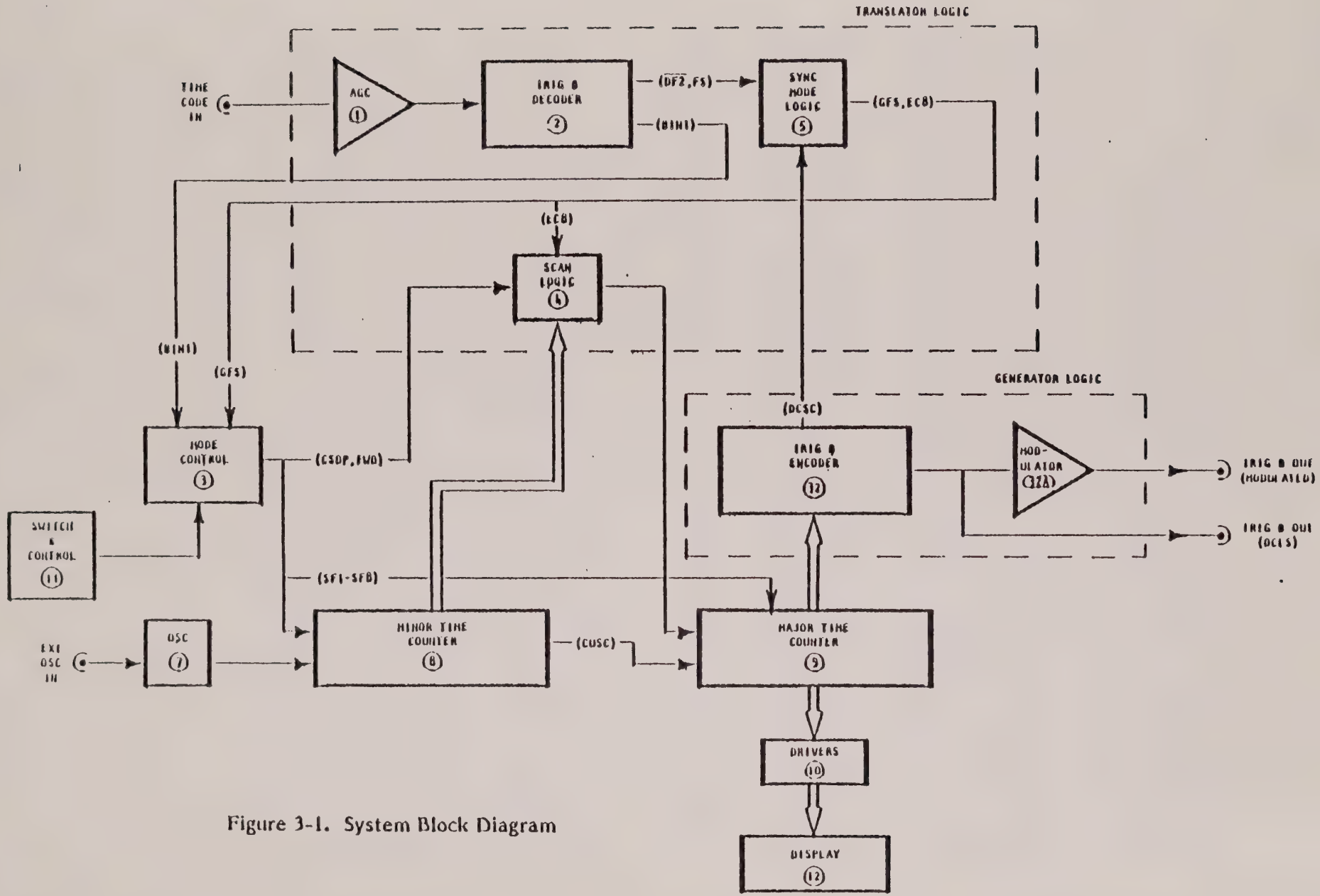


Figure 3-1. System Block Diagram

3. Code translation components - this network contains the AGC assembly, IRIG B decoder, scan logic and sync mode logic. Its primary purpose is to condition the incoming code signal, extract the essential code elements, and load the major time counter with the translated time value. The error frame bypass feature is also controlled by this logic.

3.3.1 Time Code Generation

Time code generation is performed by the IRIG B encoder and its associated modulator. The encoder consists of a two-level multiplexer and a series of ancillary gates. These elements employ the contents of the minor and major time counters to formulate the code format and to insert the appropriate time information. The encoder produces a dc-level shift version of the code, which is applied to both the modulator and an output connector. The modulator uses a 1-kHz sine wave to modulate the code signal, which is also routed to an output connector.

Basic timing information is accumulated by the minor and major time counters. The minor time counter is clocked by a crystal controlled oscillator, and accumulates hundredths-of-milliseconds through tenths-of-seconds. The major time counter (clocked by a 1-pps signal from the minor time counter) accumulates units-of-seconds through hundredths-of-days. In addition, the major time counter is loaded with an initial value when the operator presets the start time before initiating code generation.

Selection of the generate mode is controlled by the mode control logic in conjunction with the switch and control network. All time information appearing on the LED display is produced by the major time counter.

3.3.2 Time Code Translation

Translation of an incoming IRIG B signal begins in the AGC assemlby, which normalizes the amplitude and derives clocking pulses from the 1-kHz code carrier. The IRIG B decoder employs the information from the AGC to reconstruct the dc envelope of the code and to extract the position identifier and binary 1 components. Binary 1 information (termed BIN 1) is routed to the mode control logic, where it is converted to four lines of parallel data for use in updating the major time counter.

Time is accumulated by the minor and major time counters, which are initially clocked by a 1-kHz signal derived from the IRIG B carrier. The time value appearing on the LED display and at optional rear panel connectors reflects the contents of only the major time counter. Depending on the selected operating mode, this counter is updated at various intervals to reflect the time value represented by the incoming code. Counter updating is controlled by the sync mode logic, which implements the error frme bypass feature. This logic compares data from the IRIG B Encoder and Decoder networks. If one or more errors are detected, the scan logic is directed to strobe the time value from the input code into the major time counter as required by the error frame bypass mode.

3.4 LOGIC DESCRIPTION

The following text includes a detailed description of the Model 9300 TCG/T. Supporting illustrations will consist primarily of the engineering drawings in Section Six.

3.4.1 ACG Assembly (1)

The automatic gain control (AGC) assembly contains a wide-band input amplifier and the code strippers which normalize the incoming time code signal and derive clocking signals for the decoder. The AGC amplifier is designed for a 100-millivolt to 10-volt dynamic range and a frequency response of 10 Hz to 300kHz; no adjustments are required.

After the input signal is normalized by the AGC, preset level comparators develop clock signals for decoding. The ØA clocking pulse, which occurs at the positive zero-axis crossing of the carrier, is used throughout the unit for clocking and synchronization. The ØC signal is the mark clock which occurs only each half-cycle of the carrier modulation (mark amplitude cycles).

Figure 3-2 shows two cycles of a typical modulated signal. Examples of the ØA and ØC clocks are shown relative to the signal.

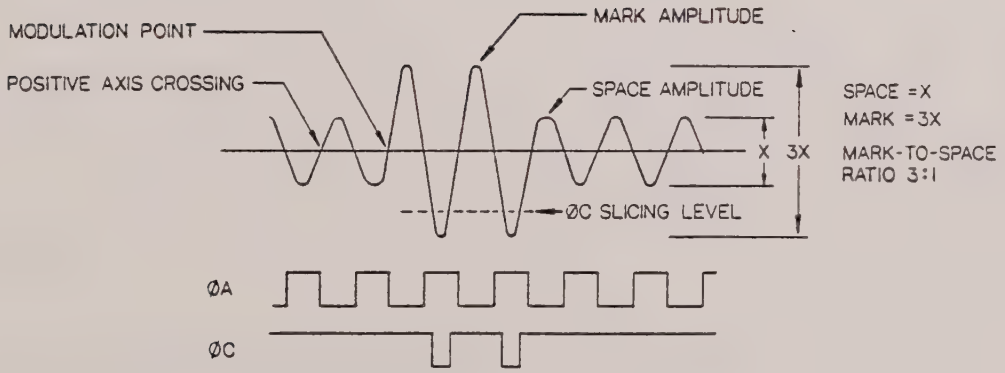


Figure 3-2. AGC Timing

3.4.2 Decoder (2)

This logic network employs the ØA, ØB and ØC clocking signals from the AGC assembly (1) to reconstruct the dc envelope of the input code. The reconstructed envelope is termed DF3. When four or more mark cycles are counted, BIN1 goes high to signify a binary one in the code. When eight mark cycles are counted, term PIC (position identifier count) goes high. Since PIC is now true, the PID (position identifier detector) flip-flop will set the next time DF3 goes low, signifying the detection of a position identifier in the IRIG B format.

Once per frame, terms PIC, PID and DF2 coincide. This occurs at plus nine milliseconds in the IRIG B format, and the decoded triggers the frame sync one-shot (FS). The resulting FS pulse sets the minor time counter (8) to a count of nine. Thus, the minor time counter is synchronized with the incoming time code.

3.4.3 Mode Control (3)

This logic network programs the unit for generate or translate mode, forward or reverse translation, and normal or inverted input code polarity.

During generate mode, the unit is automatically programmed for forward operation. In the translate mode, forward or reverse translation is controlled by the FWD/REV switch, or by the FWD* control signal if the optional parallel outputs are installed. A front panel switch conditions the 9300 to accept normal (+) or inverted (-) polarity input codes.

The mode control logic also contains a four-bit serial-to-parallel converter which converts the serial time information (BIN1) from the decoder (2) to four lines of parallel data (SF1, 2, 4, 8) in the translate mode. During generate mode, the contents of the PRESET switch are passed directly through. These outputs are applied to the D inputs of the major time counters (9), thereby permitting the start time to be preset during hold mode, and the time value to be loaded during translate mode.

Also contained in this logic network is a multiplexer which selects the clocking signals for the serial-to-parallel converter (SFS) and the milliseconds counter (CmSC*), as well as two synchronization pulses for the generate and translate modes. The serial-to-parallel converter is clocked by the 1-MHz clock (MCC) in the generate mode, and by a term from the decoder (2) in the translate mode. The milliseconds counter is clocked by tmSC8 when generate mode is selected, and by ØZ* during the translate mode. Minor time counter synchronization is performed by the GEN* flip-flop when the TCG/T is switched from Translate to Generate mode. The CmSC clock can be produced by the multiplexer only after this flip-flop is clocked by tmSC8 after Generate mode is selected (GEN·/tmSC8).

Portions of logic elements C3, D3, D9 and F9 are cross-gated to form the RUN/HOLD latch. In the generate mode, setting the MODE switch to HOLD position causes term *HOLD to go low. The halts and resets the minor time counter (8) and enables major time preset pushbuttons via term $\overline{\text{PSE}}$.

An exclusive-or element (D8 pins 1, 2, and 3) permits a low-pass filter in the AGC to be activated by either the front panel FILTER IN/OUT switch (1FSC) or by a control signal (termed $\overline{\text{SEARCH}}$) associated with the optional parallel output feature.

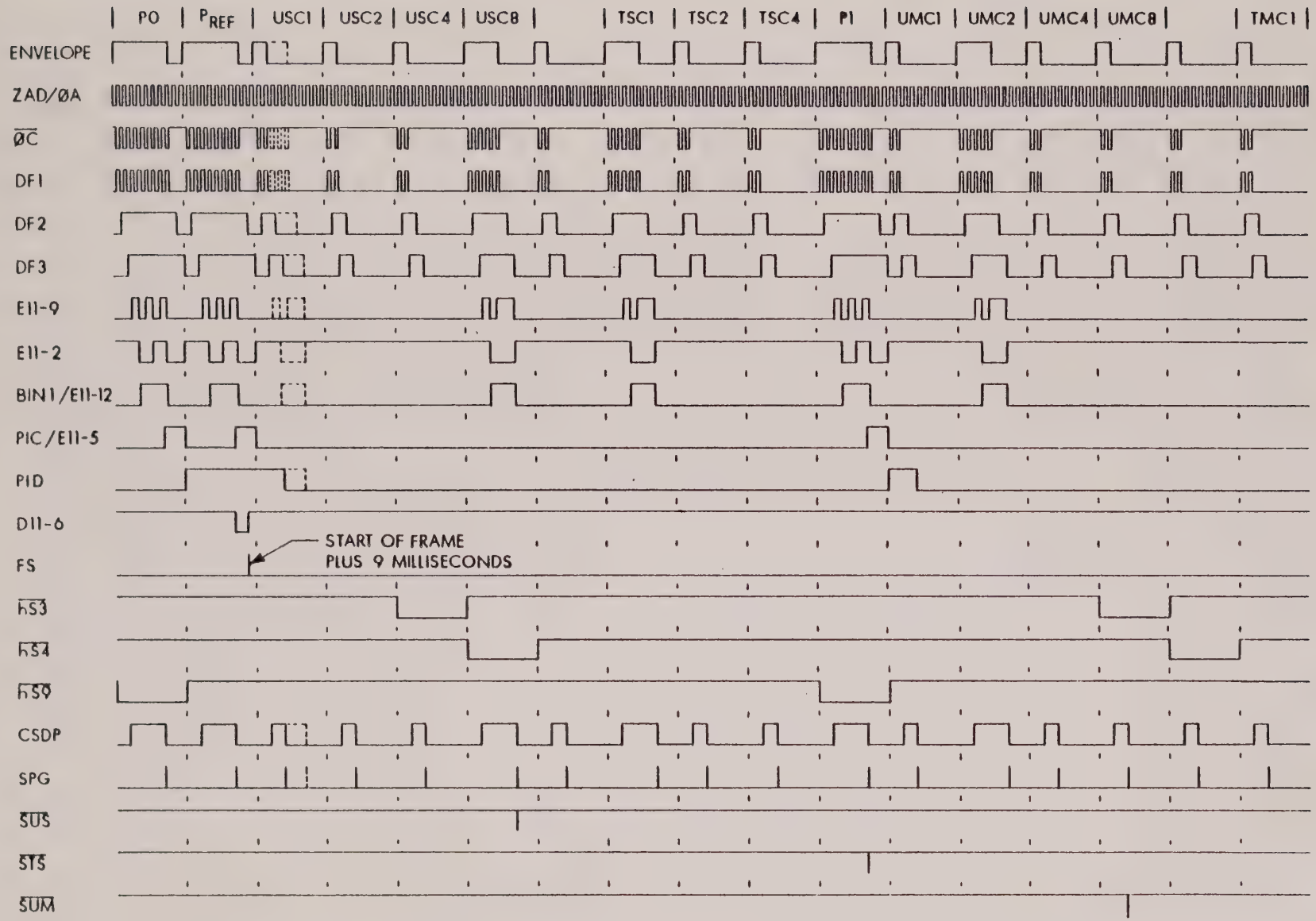


Figure 3-3. Decoder/Sync Mode Logic Timing
(sheet 1 of 2)

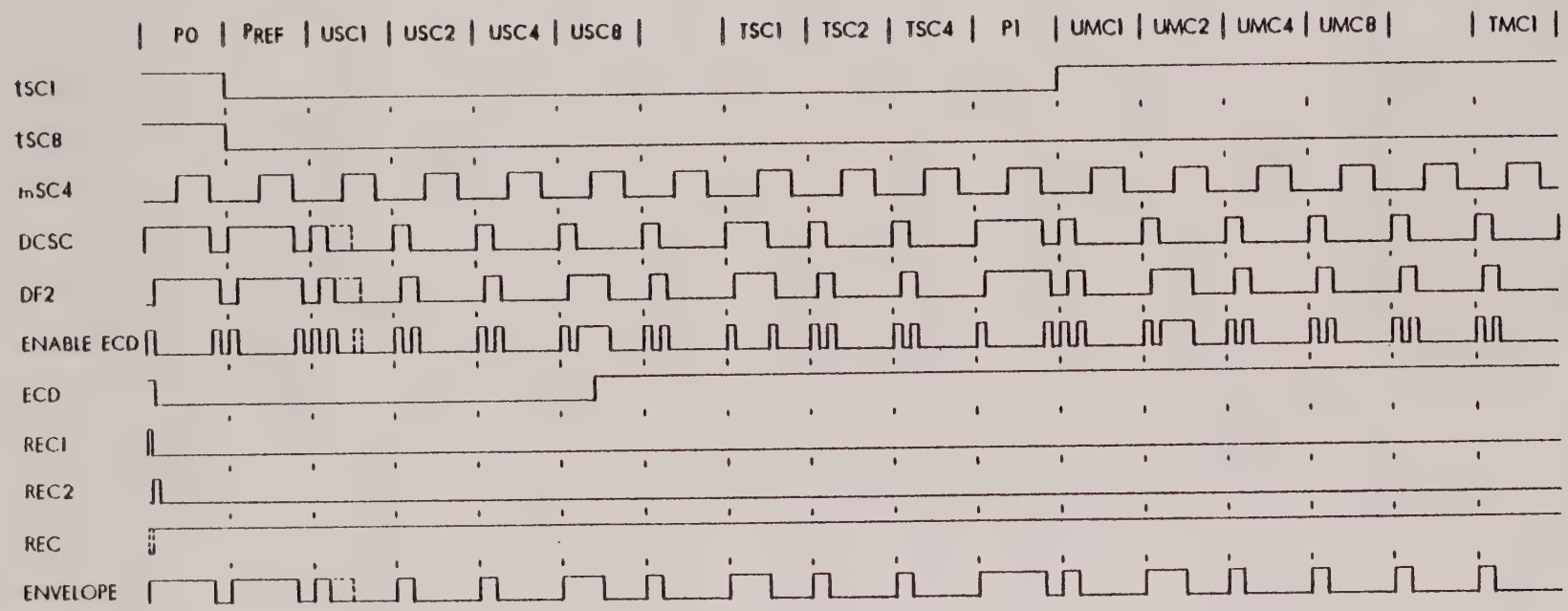


Figure 3-3. Decoder/Sync Mode Logic Timing
(sheet 2 of 2)

3.4.4 Scan Logic (4)

This network generates the load pulses which strobe the parallel data from the serial-to-parallel converter (3) into the major time counter (9).

Assignment to the proper group (seconds, minutes, hours or days) is accomplished by logic elements C5 and C7. Assignment to the proper portion of each group is accomplished by elements E6, and E7, which generate units data strobe pulses (UDSF, UDSR) and tens data strobe pulses (TDSF, TDSR) for both forward and reverse operation.

Forward or reverse strobes are selected by logic element D7. The two load pulses are factored by one-shot SPG, which limits the strobe pulses ($\overline{SPA}$ and $\overline{SPB}$) to a duration of approximately one microsecond. Term $\overline{SPG}$ inhibits the strobes in the generate mode or until the selected number of errored frames ($\overline{EC8}$) from sync mode logic (5) are counted during translate mode.

3.4.5 Sync Logic (5)

This logic serves as a digital filter to prevent erroneous information from being displayed or from disturbing the various outputs. The network is not used during code generation, or when reverse translation is selected.

The output of the IRIG encoder (/DCSC) (32) is serially compared with the decoder output. ($\overline{DF2}$). If a discrepancy exists between the two, the error detector flip-flop (ECD) will set. When ECD is reset at the end of the frame, error counter element C10 is clocked one time. The setting of the MODE-BYPASS switch (1, 2, 4, 8, oo) determines how many errored frames will be counted before counter output EC8 goes true. When this occurs, the error counter clocks are inhibited and the scan logic is enabled, allowing the input data to be loaded into the major time counter and the minor time counter to be re-synchronized by term $\overline{GFS}$.

If a valid frame is detected before the selected number of errored frames is detected, the error counter is reset by term $\overline{REC}$. Thus, synchronization will not be disturbed until the selected number of errored frames has been counted.

With the MODE/BYPASS switch in the TRANS position, EC8 is held true continuously and the unit is synchronized each frame. With oo selected, the unit is never synchronized to the incoming code and acts as a generator, using the input code carrier as a time base.

3.4.6 Time Base Logic (7)

This logic provides the 1-MHz time base for the generator. Four time bases are available for the 9300 TCT/G: two 1-MHz crystal oscillators, a 10-MHz crystal oscillator and a divide-by-ten element, or an external 1-MHz sine-wave input with a level converter. The output is a TTL 1-MHz pulse (MCC).

3.4.7 Minor Time Counter (8)

The minor time counter comprises of a series of decade counting units (DCU's) which divide the 1-MHz clock to 100 KPPS (usec8), 10 KPPS (hmsc8), 1 KKPS (tmsc8), 100 PPS (msc8), 10 PPS (hsc8), and 1 PPS (tsc8). The /HOLD term prevents the counter from updating and holds each decade reset during hold mode. Also contained on this logic are four buffers which isolate the four standard pulse rate outputs. A timing diagram is shown in Figure 3-4.

3.4.8 Major Time Counter (9)

The Major Time Counter consists of a series of up/down counters which accumulate units-of-seconds through hundreds-of-days information (see Figure 3-5). Radix control for each counter segment is performed by a separate one-shot element in the following manner:

One-Shot	Function
RTS	Resets seconds counters at 60 seconds.
RTM	Resets minutes counters at 60 minutes.
RHC	Resets hours counters at 24 hours.

The counters can be set to a predetermined time value during either the hold or translate mode. In hold mode the operator loads an initial start time by pressing the pushbutton switch beneath each digit in the LED display. Each switch applies a logic 0 to pin 11 of its respective counter segment, and the value represented by preset lines SF1 through SF8 is loaded. In translate mode, loading is controlled by strobe pulses from the Scan Logic rather than pushbuttons.

3.4.9 Display Drivers

This logic consists of a series of four-to-seven line decoders, and converts the four-line BCD output of the major time counter (9) to the seven-line format required by the L.E.D. Display (12).

3.4.10 IRIG B Encoder (32 & 32A)

This logic network employs terms from the minor and major time counters to produce dc-level-shift and modulated versions of the IRIG B time code. The elements of the encoder are shown on drawing (32), and the modulator is shown on drawing (32A).

Basically, the encoder consists of primary and subordinate multiplexers (MUX's), and a series of ancillary gating elements. The primary MUX scans the outputs of the major time counter in a sequence established by terms hSC1 through hSC8 (from the minor timer counter), which are simultaneously applied to the address inputs of each MUX element (A10 - A14). As a result of the scanning process, the MUX ouput lines (X0 through X4) reflect the following serial time information:

MUX LINE	DATA
X0	Units and tens of seconds
X1	Units and tens of minutes
X2	Units and tens of hours
X3	Units and tens of days
X4	Hundreds of days

The subordinate MUX (A15) scans the X0 through X4 lines in the sequence determined by terms tSC1 through tSC8, producing a serial representation of the time-of-year at its output ($\overline{D}$).

The remaining elements on drawing (32) control the DCSC flip-flop (A7) to produce a dc-level-shift version of the IRIG B code. The DCSC flip-flop is enabled at a 100-pps rate and clocked true by the CZC* pulse (1000 pps) at A7-12. Resetting occurs when a CZC*

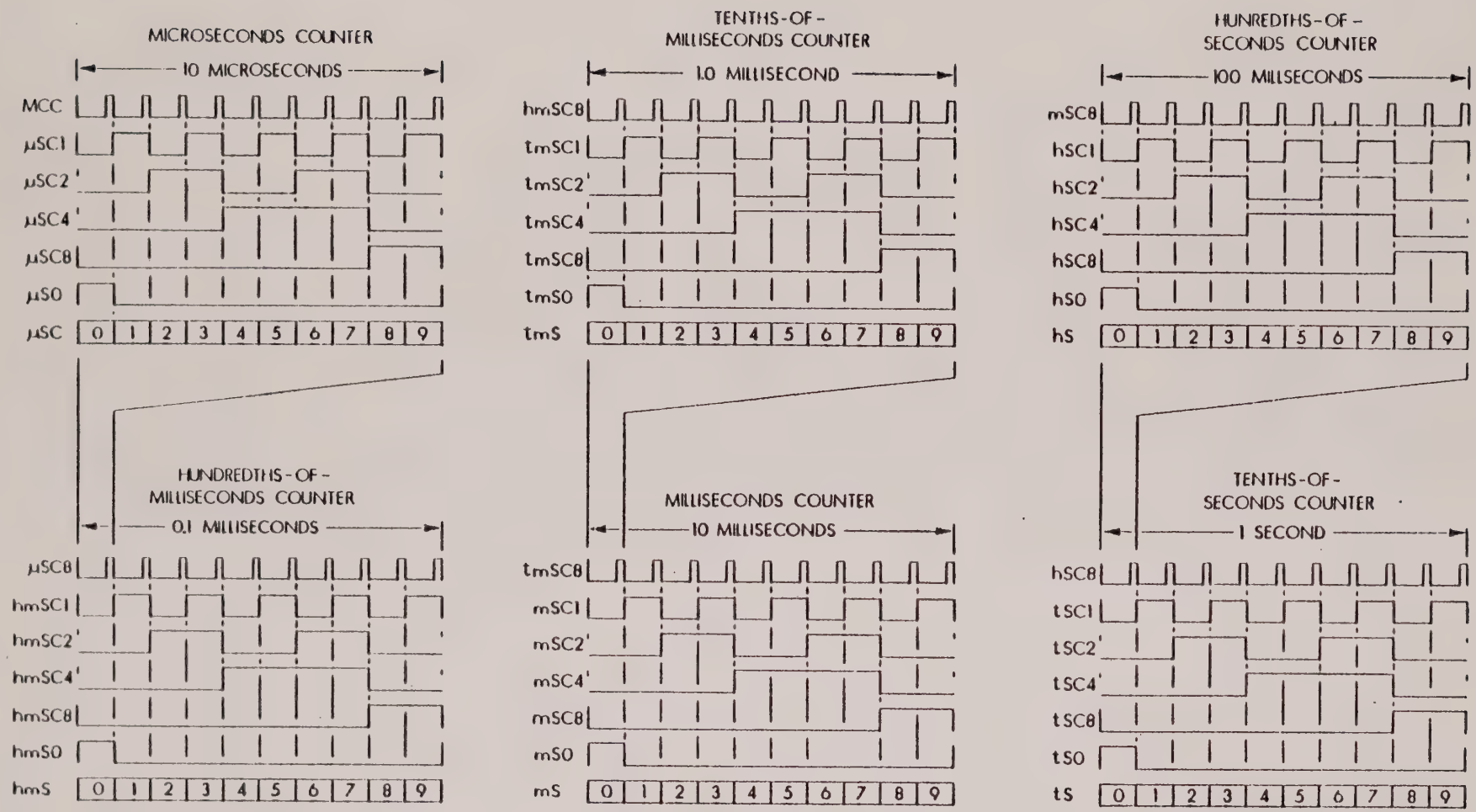


Figure 3-4. Minor Time Counter Timing Diagram

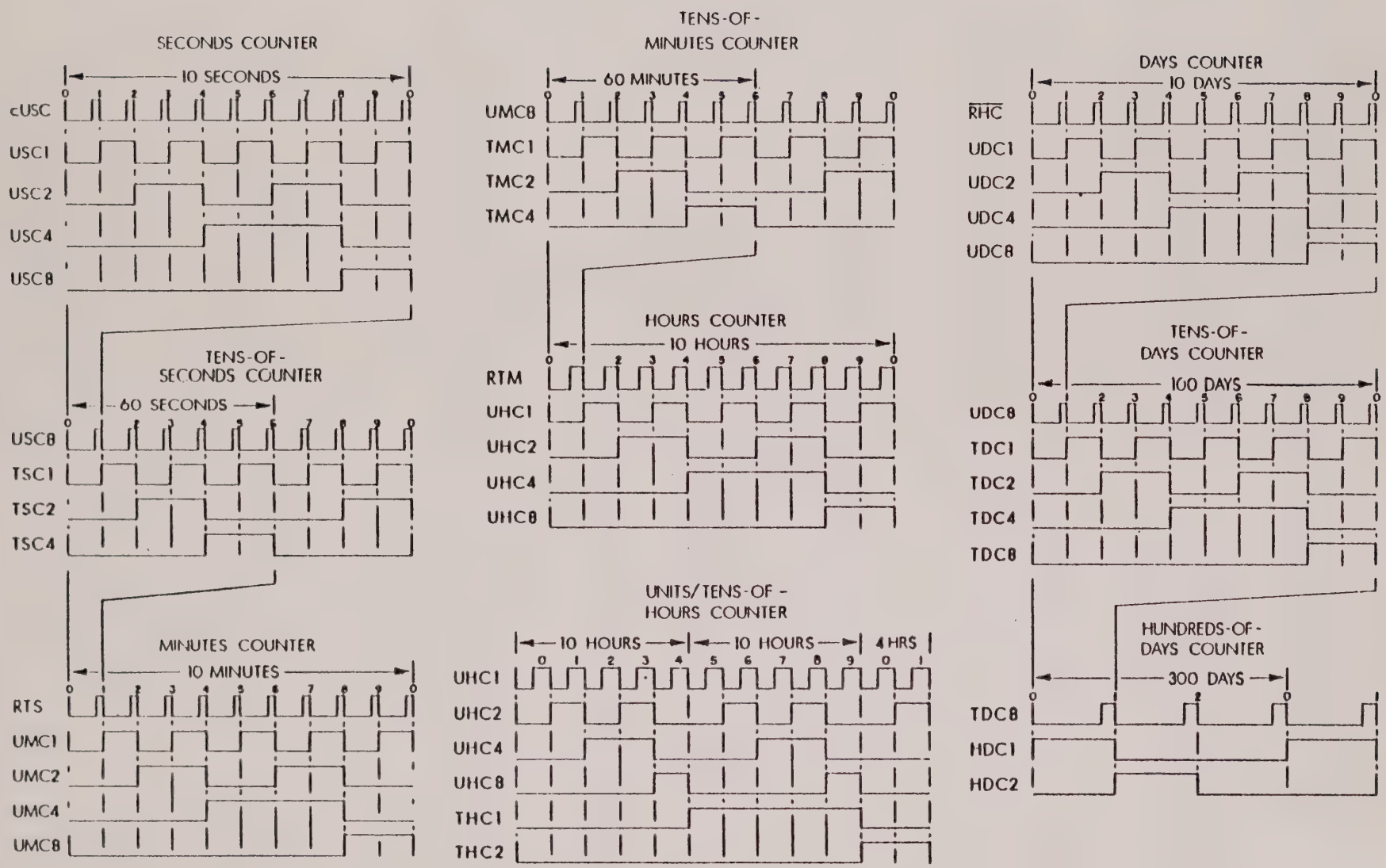


Figure 3-5. Major Time Counter, Timing Diagram

pulse occurs while the level at A7-4 is true. This occurs at two milliseconds as long as a binary 1 or a position identifier is not present. Resetting occurs at the count of five (five milliseconds if a binary 1 is present in the serial time information.

At a 10-pps rate, and at a count of 9, the DCSC reset enable is delayed for 8 counts, thus generating an 8 millisecond-wide position identifier. Once per second, at T-zero time, A7 pin 5 (XOYO) is set true. This generates the frame reference pulse of the IRIG B time code and prevents the first pulse of each frame period from being reset until a count of 8 milliseconds. The output of DCSC is buffered and presented as the DC shift code output.

On (32A) the output of A8 pin 6 is a 1KHz squarewave. The odd harmonics are filtered from the squarewave to generate a sinewave that is modulated by the DC code envelope ($\overline{\text{DSCS}}$) by means of FET Q1 and IC A17. The output of A17, pin 1, is attenuated by a potentiometer, R17, which is used to set the level of the IRIG B modulated serial time code. The output amplifier consists of A17, Q2, and Q3. The gain is set by resistors R18 and R20 and is set to be a fixed gain of 10. The modulated output is available on E6.

3.4.11 Power Supply (49)

The Power Supply furnishes regulated ±15V DC and +5V DC to the unit. The ±15V DC regulators are integrated circuit regulators with internal fault protection. The +5V DC regulator employs a LM305 voltage regulator and is of the switching type.

The LM305 is essentially an operational amplifier with built-in Zener reference. When the voltage on pin 6 falls a few millivolts below that of the internal reference, Q1 and Q2 are turned on and the voltage on the 5-volt line begins to rise. Q1 and Q2 turn off as the voltage on A1-6 rises above the reference level. L1 tries to maintain constant current flow and current begins to flow through CR2. This continues until Q1 and Q2 are again turned on and the cycle is repeated.

The switching regulator is thus an efficient method of obtaining constant 5V DC from an unregulated source, since power is dissipated in Q1 only when it is either on, or changing states.

For 5 volts from a 23V source, Q1 is on approximately 25 percent of the time. Transistors Q3 and Q4 provide short circuit protection by forcing the regulator to decrease the output voltage when the current through R7 becomes excessive. When the output voltage becomes too high, CR5 conducts and CR6 is turned on. The current limit circuit then shuts down the regulator.

3.5 GLOSSARY OF LOGIC TERMS

Table 3-1 lists the origins and general functions of the logic signals in the basic 9300 TCG/T.

Table 3-1. Glossary Of Logic Terms

Term	Origin	Function
AC CODE	(32A)	IRIG B encoder output - 1-kH_2 modulated.
AGCF	(3)	AGC filter select.
AGCP	(3) & (1)	Signal inversion control input for AGC.
BIN1	(2)	Binary 1 detect.
CBF	(5)	
CMSC	(3)	Milliseconds counter clock.
COH	(9)	Tens-of-hours counter carry output.
CSDP	(3)	Clocks SDP flip-flop at position identifier time.
ctSCD	(8)	Tenths-of-seconds counter clock (down).
ctSCU	(8)	Tenths-of-seconds counter clock (up).
cUSC	(8)	Units-of-seconds counter clock.
CUSCD	(11)	Units-of-seconds counter clock (down).
CUSCU	(11)	Units-of-seconds counter clock (up).
CZC*	(32)	1k-pps clock for DSCS flip-flop.
DC COD	(32)	IRIG B encoder output-dc envelope (buffered).
DCSC	(32)	IRIG B encoder output-dc envelope.
DF1	(2)	Decode function 1 - positive pulse occurs with each mark cycle of code carrier.
DF2	(2)	Decoder function 2 - represents dc envelope of incoming code.
DF3	(2)	Decoder function 3 - identical to DF2, but delayed by one ØA clock period.
EC1-EC8	(5)	Error frame counter outputs.
ECD	(5)	Error detect flip-flop. Compares decoder output $\overline{DF2}$ with IRIG B Encoder output $\overline{DCSC}$.

Table 3-1. Glossary Of Logic Terms (Continued)

Term	Origin	Function
ERR	(5)	Error frame detect latch.
$\overline{\text{ERROR}}$	(5)	Error frame detect latch.
FBoo	(11)	MODE select switch output. Selects infinit number of error frames for bypass.
$\overline{\text{FB1}}$-$\overline{\text{FB8}}$	(11)	MODE select switch outputs. Error frame bypass values.
$\overline{\text{FS}}$	(2)	Frame sync pulse. Synchronizes minor time counter. Occurs once per frame.
$\overline{\text{FS}}$*	(3)	
FWD	(3)	Direction control for serial-to-parallel counter.
$\overline{\text{GEN}}$	(11)	MODE select switch output. Selects generate mode.
GEN*	(3)	Synchronizes minor time counter when unit is switched from translate to generate mode.
$\overline{\text{GFS}}$	(5)	Synchronizes minor time counter.
$\overline{\text{GFS}}$*	(3)	
GO	(11)	Tape search control term (optional).
$\overline{\text{HOLD}}$	(3)	Hold control latch output.
$\overline{\text{HOLD}}$*	(11)	MODE select switch output. Selects hold mode.
hSC1-hSC8	(8)	Hundredths-of-seconds counter outputs.
IFSC	(11)	Filter-select switch output.
INV	(11)	Polarity switch output.
mSC1-mSC8	(8)	Milliseconds counter outputs.
PIC	(2)	Position identifier count.
PID	(2)	Position identifier detect flip-flop.
$\overline{\text{PSE}}$	(3)	Buffered version of $\overline{\text{HOLD}}$.
$\overline{\text{READ}}$	(11)	MODE select switch output. Selects read mode.
$\overline{\text{REC}}$	(5)	Error counter reset. Resets counter if valid frame is detected before preselected number of error frames occurs.

Table 3-1. Glossary Of Logic Terms (Continued)

Term	Origin	Function
REV	(11)	Code direction switch output.
RHC	(9)	Days counter clock - 24-hour radix.
RTM	(9)	Hours counter clock - 60-seconds radix.
RTS	(9)	Minutes counter clock - 60-seconds radix.
SDP	(4)	Triggers SPG one-shot.
SF1-SF8	(3)	Serial-to-parallel converter outputs.
SF1-SF8*	(11)	PRESET thumbwheel switch outputs.
SFS	(3)	Serial-to-parallel converter clock.
$\overline{\text{SHD}}$	(4) & (11)	Hundreds-of-days counter preset control.
$\overline{\text{SPA}}$	(4)	Scan pulse-units data.
$\overline{\text{SPB}}$	(4)	Scan pulse-tens data.
SPG	(4)	Scan pulse generator output. Defines duration of preset control pulses for major time counter.
$\overline{\text{SPG}}$	(4)	Inhibits scan pulse during GEN mode or until selected number of error frames is detected during TRANS mode.
$\overline{\text{START}}$	(11)	START pushbutton switch output.
$\overline{\text{STD}}$	(4)	Tens-of-days counter preset control.
$\overline{\text{STH}}$	(4) & (11)	Tens-of-hours counter preset control.
$\overline{\text{STM}}$	(4) & (11)	Tens-of-minutes counter preset control.
$\overline{\text{STS}}$	(4) & (11)	Tens-of-seconds counter preset control.
$\overline{\text{SUD}}$	(4) & (11)	Units-of-days counter preset control.
$\overline{\text{SUH}}$	(4) & (11)	Units-of-hours counter preset control.
$\overline{\text{SUM}}$	(4) & (11)	Units-of-minutes counter preset control.
$\overline{\text{SUS}}$	(4) & (11)	Units-of-seconds counter preset control.
TDSF	(4)	Tens data scan pulse (forward)
TDSR	(4)	Tens data scan pulse (reverse)

Table 3-1. Glossary Of Logic Terms (Continued)

Term	Origin	Function
THC1-THC2	(9)	Tens-of-hours counter outputs.
TMC1-TMC4	(9)	Tens-of-minutes counter outputs.
TSC1-TSC4	(9)	Tens-of-seconds counter outputs.
tSC1-tSC8	(8)	Tenths-of-seconds counter outputs.
tSC8B	(32)	Buffered version of tSC8.
UDSF	(4)	Units data scan pulse (Forward).
UDSR	(4)	Units data scan pulse (Reverse).
UHC1-UHC8	(9)	Units-of-hours counter outputs.
UMC1-UMC8	(9)	Units-of-minutes counter outputs.
USC1-USC8	(9)	Units-of-seconds counter outputs.
X0 - X5	(32)	IRIG B encoder multiplexer outputs.
ØA/ZAD	(1) & (11)	AGC output square wave derived from carrier of incoming modulated time code signal.
ØB	(1)	Inverted version of ØA.
ØC	(1)	AGC peak detector output.
ØA*	(2)	Decoder clock derived from ØA output of AGC.
ØB*	(2)	Inverted version of ØA* - decoder clock.
MCC	(7)	Primary clocking pulse rate (from internal or external source).
100PPS	(8)	100-pps pulse rate derived from mSC8*.
10PPS	(8)	10-pps pulse rate derived from hSC8*.
1PPS	(8)	1-pps pulse rate derived from tSC8*.
1KHZ SINE	(32A)	IRIG B encoder output - 1kHz sine wave derived from minor time counter.
1KPPS	(8)	1k-pps pulse rate derived from CmSC*.
1MHZ	(7)	1MHz clocking oscillator output (optional).

SECTION FOUR

ADJUSTMENTS

4.1 INTRODUCTION

This section describes the adjustment potentiometers in the basic 9300 TCG/T. Adjustments relating to optional features are described in Appendix A.

NOTE

Values shown in parenthesis indicate nominal settings used at the factory.

4.2 SINEWAVE SHAPER/MODULATED ASSEMBLY

1. Level adjustment - potentiometer R17. Range is 0-to-10 Vpp on the mark amplitude of the output code (3.0 Vpp nominal).

2. Modulation ratio adjustment - potentiometer R15. Range is 2:1 to 4:1 mark-to-space ratio the output code (3:1 nominal).

3. Phase adjustment - potentiometer R7. Sets the phase of the carrier frequency to ensure continuity when amplitude modulation takes place.

4.3 POWER SUPPLY ASSEMBLY

Potentiometer R10 is used to adjust the output level of the +5-volt regulator. The level should be +5V $\pm$2%.

SECTION FIVE

MAINTENANCE

5.1 GENERAL

The Model 9300 TCG/T utilizes solid-state components. There are no moving parts or parts with limited life. No periodic maintenance is required if the unit is used under normal conditions. If the instrument is exposed to unusual operating conditions, such as high dust or high humidity environments, or is dropped or otherwise damaged, it may be necessary to perform certain inspection and/or repair procedures.

WARNING

Hazardous voltage levels exist in this equipment when power is applied. Exercise extreme caution when protective covers are removed.

5.2 DRAWING STRUCTURE

The drawings contained in Section Six of this manual documents the instrument to a level that will enable an experienced maintenance technician to locate and replace any functional electronic component. Documentation for structural elements such as support brackets, attaching hardware, chassis components, etc., is not normally included.

1. Top Assembly Drawing

   This drawing defines the configuration of a specific instrument. The part numbers and physical locations of all major assemblies are shown, as well as outline dimensions of the chassis. Interface connectors are also included.

2. Schematic Drawings

   Schematic drawings of all electronic circuitry are included. The numbers shown in the title blocks of these drawings correspond to the assembly numbers itemized on the Top Assembly drawing.

   In addition to showing the electronic design of the instrument, these drawings also serve as illustrations for the theory of operation in Section Three.

3. Material Lists

   Stock numbers, characteristics, quantities and reference designators for all electronic components are contained in a series of material lists in Section Seven. A separate list is provided for each major assembly in the instrument.

5.3 LOCATING COMPONENTS

When troubleshooting, the technician typically refers to the schematic drawing of a suspected assembly. After being isolated on the schematic, a faulty component can be located by finding its reference designation on the p.c. board. The characteristics and part number of the component can be determined by referring to the material list for the appropriate assembly.

Generally, the logic symbology employed in Datum drawings conforms to industry standards for functional definitions. However, a unique system is employed to show origins and destinations of logic terms. Appropriate terms are accompanied by encircled numbers (shown in parentheses within the manual text) that specify the drawings on which the terms originate, or to which they are to be routed. The encircled numbers are shown in the title blocks of all schematic drawings.

Physical locations of components on p.c. boards are specified by reference designations (A1, A2, etc.). Two basic methods of reference designator organization are employed in Datum equipment: sequential and cross-grid. When arranged sequentially, the components are placed on the boards in numerical sequence and the associated reference designators are etched on the board. The cross-grid method employs vertical columns arranged alphabetically, and horizontal columns in numerical sequence; components are referenced according to their coordinates.

5.4 INSPECTION

If it is necessary to inspect the unit, the following should be considered:

1. Always disconnect AC power before removing the instrument cover. To remove the cover, simply remove the screw at the rear panel an slide the cover off to the rear.

2. Make a thorough visual inspection of all circuitry and wiring.

3. Check for physical integrity of all components. Look for burned or cracked components, loose physical damage, leakage of insulation compounds or general physical damage. To aid in overall maintenance and repair, each integrated circuit is mounted in an individual modular socket. Removal or replacement is therefore convenient and easy.

   It should rarely be necessary to replace an integrated circuit; however, if replacement is attempted, ensure that all component leads enter the socket and that no leads are bent under the component or extended out from the socket.

   Check to see that all IC's are firmly mounted in the socket so that good electrical contact is made.

4. Check all switches and connectors for loose or broken wires.

5. If the internal component surfaces and components have an excessive amount of dust deposited on them, use a soft brush and a low pressure stream of air to remove any foreign material.

CAUTION

Do not clean PC boards or small internal components with a stiff brush or solvents since damage to the circuits may result. A high powered vacuum cleaner device should not be used on small internal components.

6. Wipe the external surfaces of the instrument with a soft damp cloth to remove dirt, fingerprints and other foreign material.

7. Replace the cover and reconnect the AC power and input connector. Check operation. If performance does not match or exceed the specifications listed, corrective maintenance is in order.

5.5 PRINTED CIRCUIT BOARD REPAIR

Removal and insertion of IC components can be easily made as described above. Should it be necessary to replace conventional components which are soldered to the circuit board, cut the leads of the part near the lead holes. Using a low-power (50 watts or less) soldering iron, apply heat sparingly to each cut lead. As soon as the solder melts, slip the lead from the hole and clean the hole with a tooth pick. Clean the board surfaces with isopropyl alcohol. Form the tinned leads of the replacement part and insert in cleaned holes, trimming the leads to extend 1/16-inch beyond the back surface of the board. Only 63/37 solder with a maximum diameter of 1/16 inch should be used. Solder the leads to the board and use a hemostat, long nosed pliers, or other heat sink on the leads of all semiconductor devices and quarter-watt resistors. Allow the soldered junction to cool before removing the heat sink.

SECTION SIX

LIST OF DRAWINGS

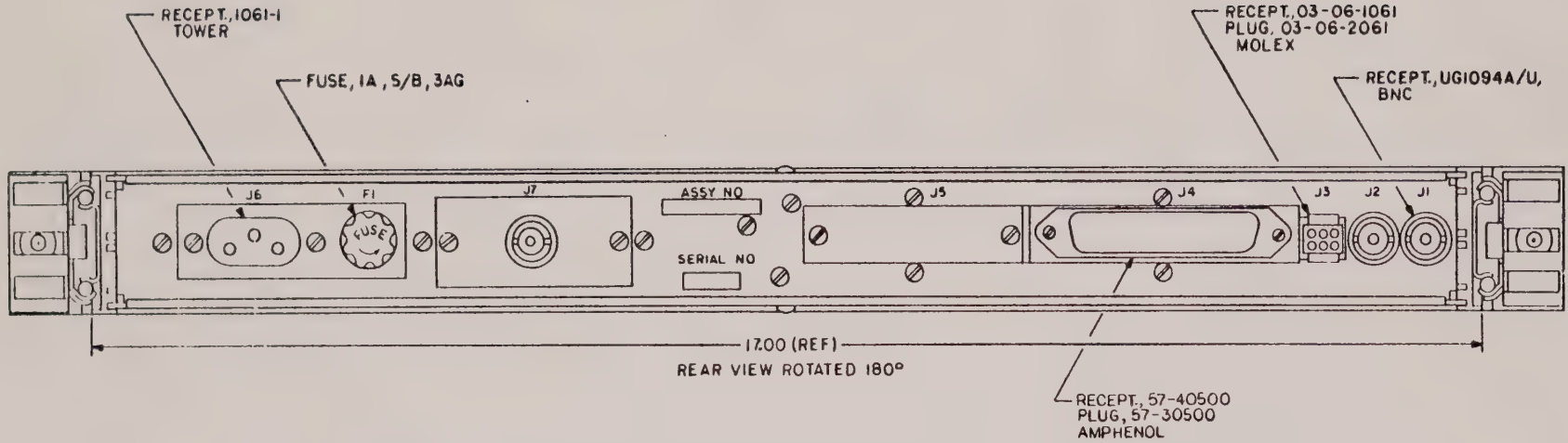
6.1 INTRODUCTION

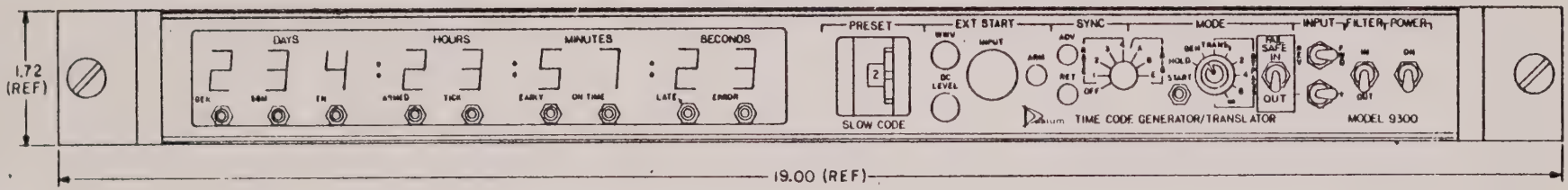
This section contains assembly, wiring and schematic drawings for the specific unit addressed by this manual. The encircled number in the title block of each drawing defines the sequence in which the drawing is contained herein. The encircled numbers are shown in parentheses in the following drawing list:

NOTE

A detailed description of the drawing structure is contained in The Theory of Operation.

1.	Top Assembly	9300-7368
2.	AGC (1)	16085 A-16085
3.	Failsafe (1B) (1C)	19168 A-19168
4.	IRIG Basic (2) (3) (4) (5) (7) (8) (9) (10)	18256 A-18256
5.	Switch & Control Logic (11)	9300-8793
6.	LED Display (12)	16549 A-16549
7.	Parallel Outputs (30)	16635 A-16635
8.	IRIG B Encoder (32)	16062 A-16062
9.	Power Supply (49)	16280 A-16280
10.	1PPS Sync (52)	18299 A-18299
11.	Modification Drawing	9300-8804





7. MODIFICATION DRAWING 9300-8804
6. SWITCH & CONTROL LOGIC 9300-8793
5. WIRING DIAGRAM 803485 (BASIC)
4. WIRE LIST 803486 (BASIC), 803589 (PARALLEL OUTPUTS), 809713 (UNIT)

J7 - 1PPS SYNC INPUT
J6 - AC POWER
J5 -
J4 - PARALLEL OUTPUTS (mS, S, M, H, D, / TAPE SEARCH)
J3 - PULSE RATES
J2 - CODE OUTPUT } IRIG B
J1 - CODE INPUT }
. SLIDES & MOUNTING BRACKETS ARE OPTIONAL

NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL. XX ± .03 XXX ± .010 ANGLES ± 1/2°

TITLE: TIME CODE GENERATOR/TRANSLATOR

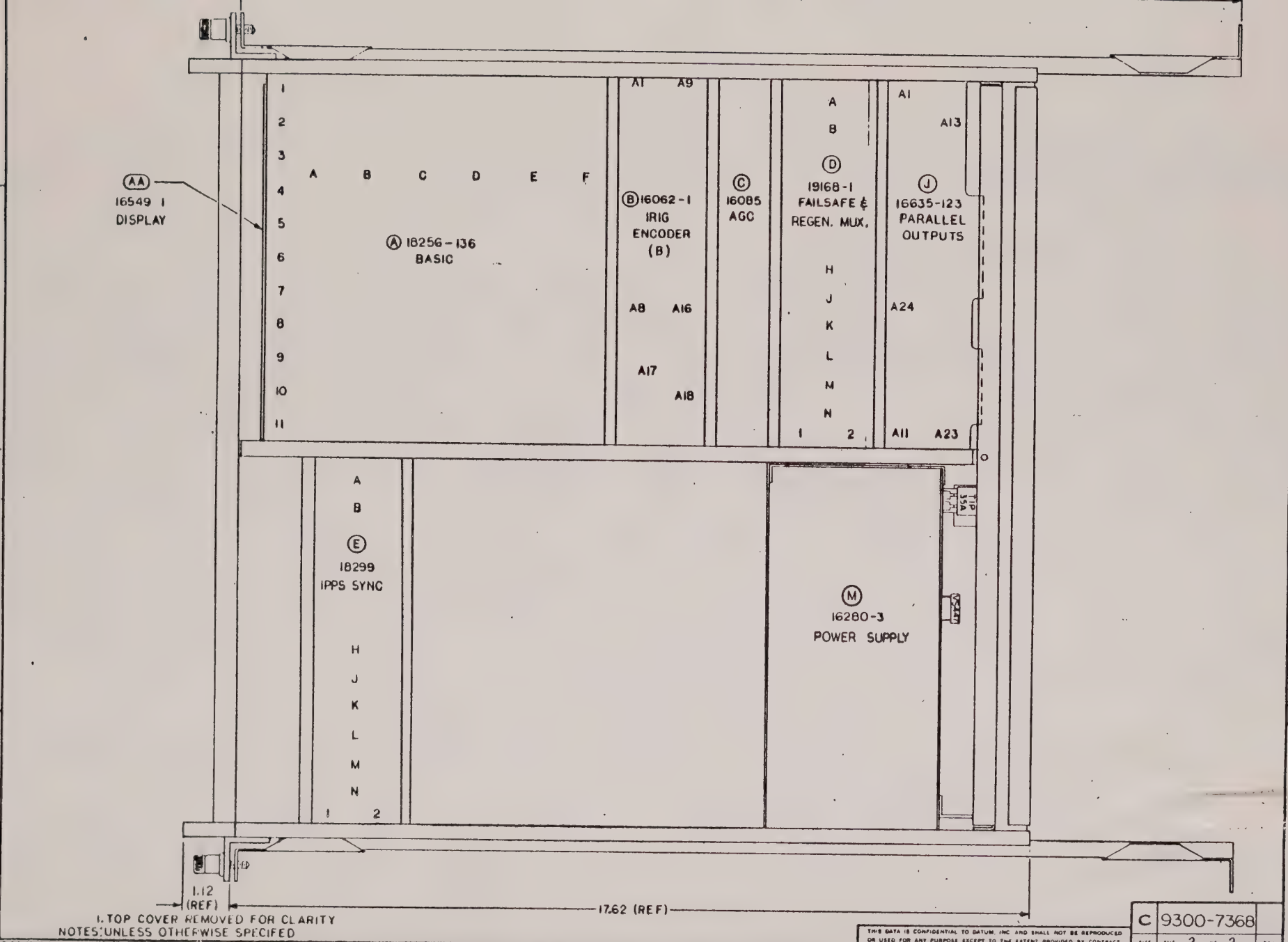
DWN PHAT-LVONG 3/3/5 DES
CHK SATINDER 3/14/95 ENGR GH 4/14/95
SCALE NONE FSC 31160

Datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

SIZE C | 9300-7368 | REV

SHT 1 OF 2

DIMUP GRAPHICS/ACCUPRESS ANAHEIM, CA 5668



NOTES: UNLESS OTHERWISE SPECIFIED
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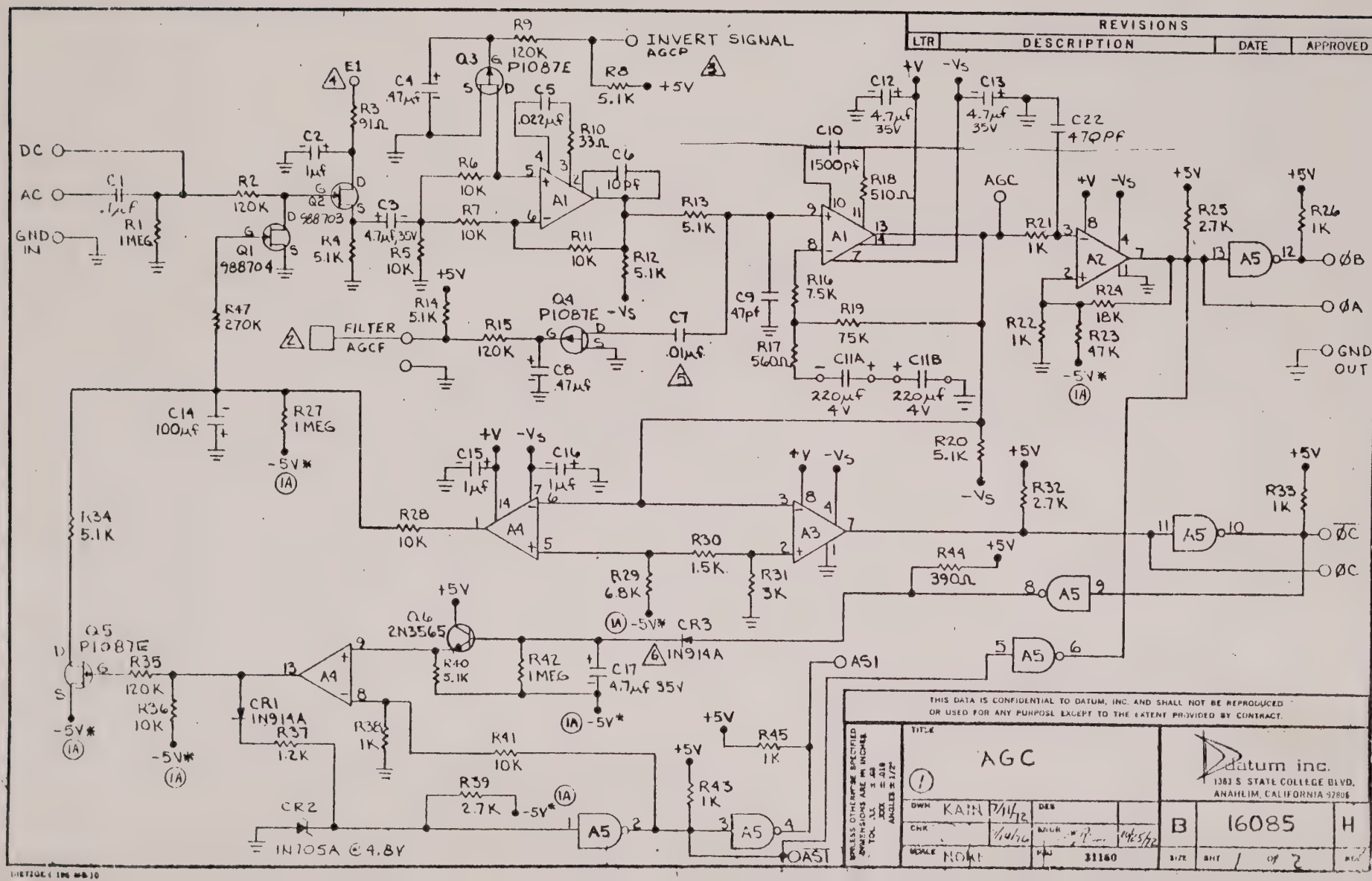
	SHT 2 OF 2	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DATE
APPROVED
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AC
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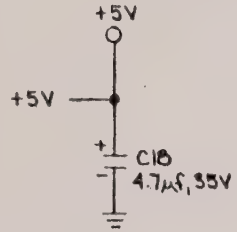
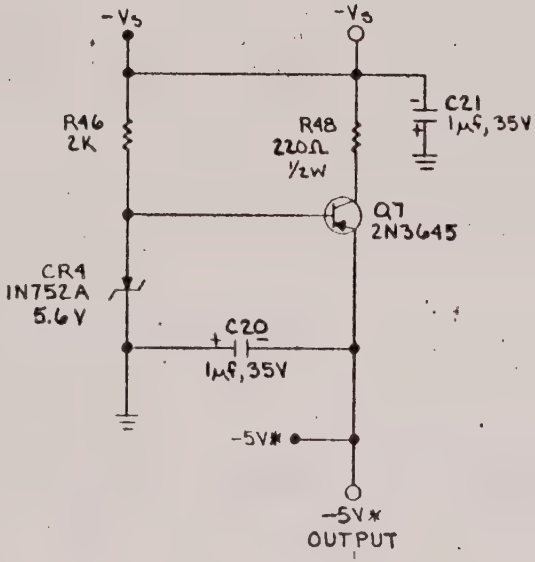
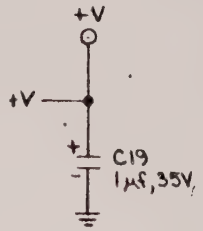
R1 1MEG
R2 120K
Q1 988704
Q2 988703
C2 1μf
R3 91Ω
R4 5.1K
C3 4.7μf,35V
R5 10K
E1
R9 120K
Q3 P1087E
C4 .47μf
C5 .022μf
R10 33Ω
R6 10K
R7 10K
A1
C6 10pf
R11 10K
R12 5.1K
R13 5.1K
R8 5.1K
+5V
INVERT SIGNAL AGCP
+V
-Vs
C12 4.7μf 35V
C13 4.7μf 35V
C22 470PF
C10 1500pf
R18 510Ω
R16 7.5K
R19 75K
R17 560Ω
C11A 220μf 4V
C11B 220μf 4V
C9 47pf
C7 .01μf
Q4 P1087E
R14 5.1K
R15 120K
C8 .47μf
FILTER AGCF
R47 270K
C14 100μf
R27 1MEG
-5V*
(1A)
AGC
R21 1K
A2
R24 18K
R22 1K
R23 47K
R25 2.7K
R26 1K
A5
ØB
ØA
GND OUT
C15 1μf
C16 1μf
A4
A3
R28 10K
R30 1.5K
R29 6.8K
R31 3K
R20 5.1K
R32 2.7K
R33 1K
R34 5.1K
R44 390Ω
ØC
ØC
Q5 P1087E
R35 120K
R36 10K
Q6 2N3565
R40 5.1K
R42 1MEG
C17 4.7μf 35V
CR3 IN914A
R38 1K
CR1 IN914A
R37 1.2K
R41 10K
R39 2.7K
CR2 IN105A @4.8V
R45 1K
R43 1K
AS1
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOL .XX ± .03
.XXX ± .010
ANGLES ± 1/2°
TITLE
AGC
DWN KAIN 7/11/72
CHK 11/10/72
MGR 11/25/72
SCALE NONE
PART NO. 31160
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
B
16085
H
SIZE
SHT 1 OF 2
REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	ADDED C22	9-27-72	R.F.
B	ADDED R20 TO SCHEMATIC +E WAS +Vs	1-22-73	R.H.
C	Q3,4,5 WERE 2N4342	6-13-73	R.J.
D	ADDED C11A & C11B	7-13-73	R.H.
E	Q1 WAS 988703	9-12-73	R.H./C.V.
F	C12 & C13 WERE 1 μf	9-21-73	R.H./C.V.
G	R3 WAS TO +E; ADDED E1	11-26-73	R.H./R.S.
H	ADDED ⑥	7-7-79	S.A.







⑥ -2 C17 IS 27μf 10V, R27 IS 4.7M

⑤ -1 C7 IS .001μf.

④ WIRE TO +15 OR +5V AS REQUIRED

③ THIS POINT GROUNDED TO INVERT SIGNAL - REVERSE MODE

② SEE PARALLEL OUTPUT SCHEM FOR PIN NUMBER

① REMOVE FOR REMOTE OR HIGHSPEED OPERATION

PART NO	MFR	REF
SN7405	NATIONAL	A5
μA749	FAIRCHILD	A1, A4
LM311H	NATIONAL	A2, A3

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOL .XX ± .03
.XXX ± .010
ANGLES ± 1/2°

TITLE: AGC (1A)

DWN KAIN 7/12/72 | DES RF 7/12/72
CHK 7/19/72 | ENGR 11/25/72
SCALE NONE | FSC 31160

datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

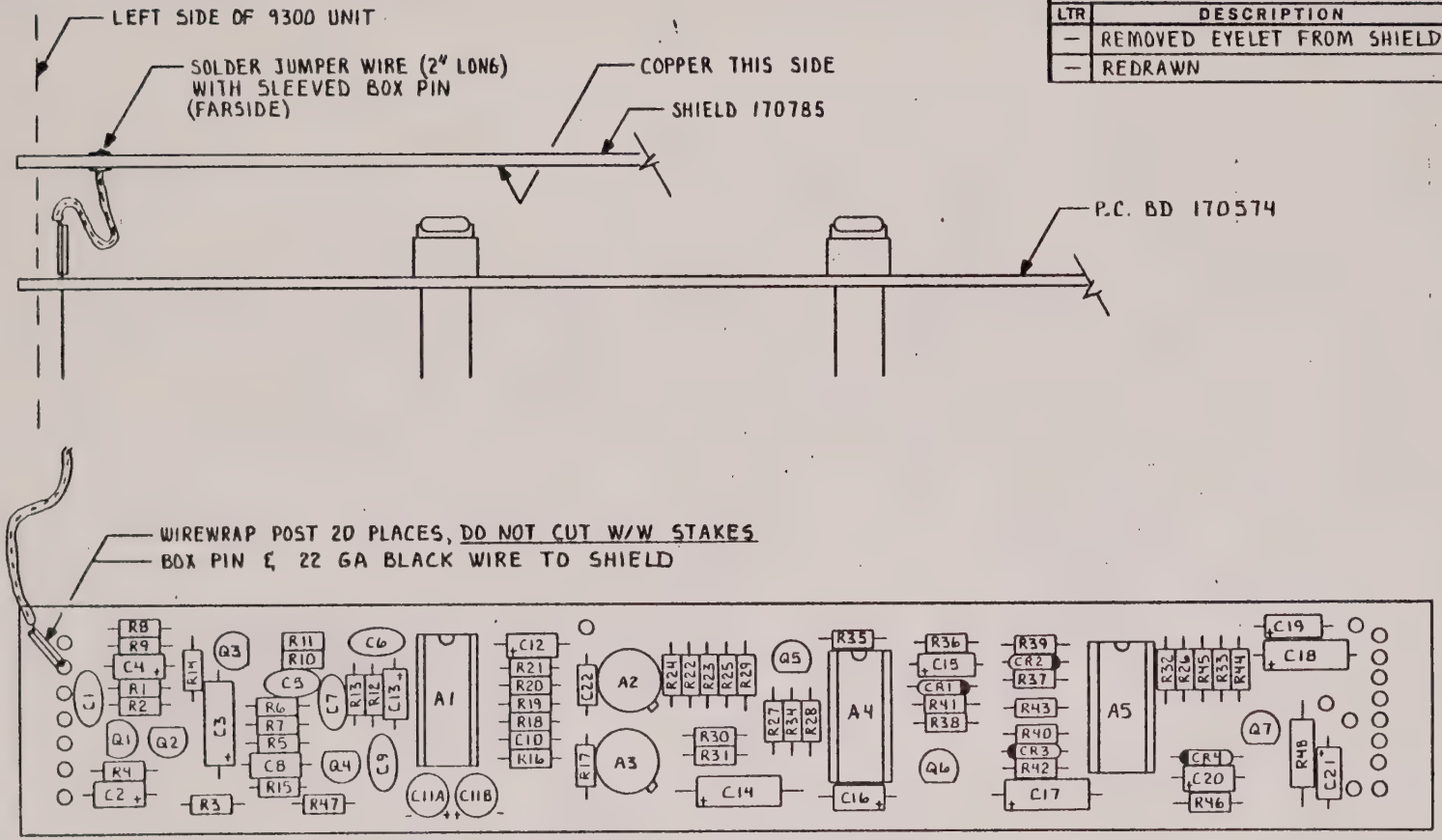
B | 16085 | H

SIZE | UNIT 2 OF 2 | REV

DIETZGEN

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
—	REMOVED EYELET FROM SHIELD	1-4-79	STEVE
—	REDRAWN	12-5-84	DL

7



REF A/W NO. 170574

NOTES: UNLESS OTHERWISE SPECIFIED

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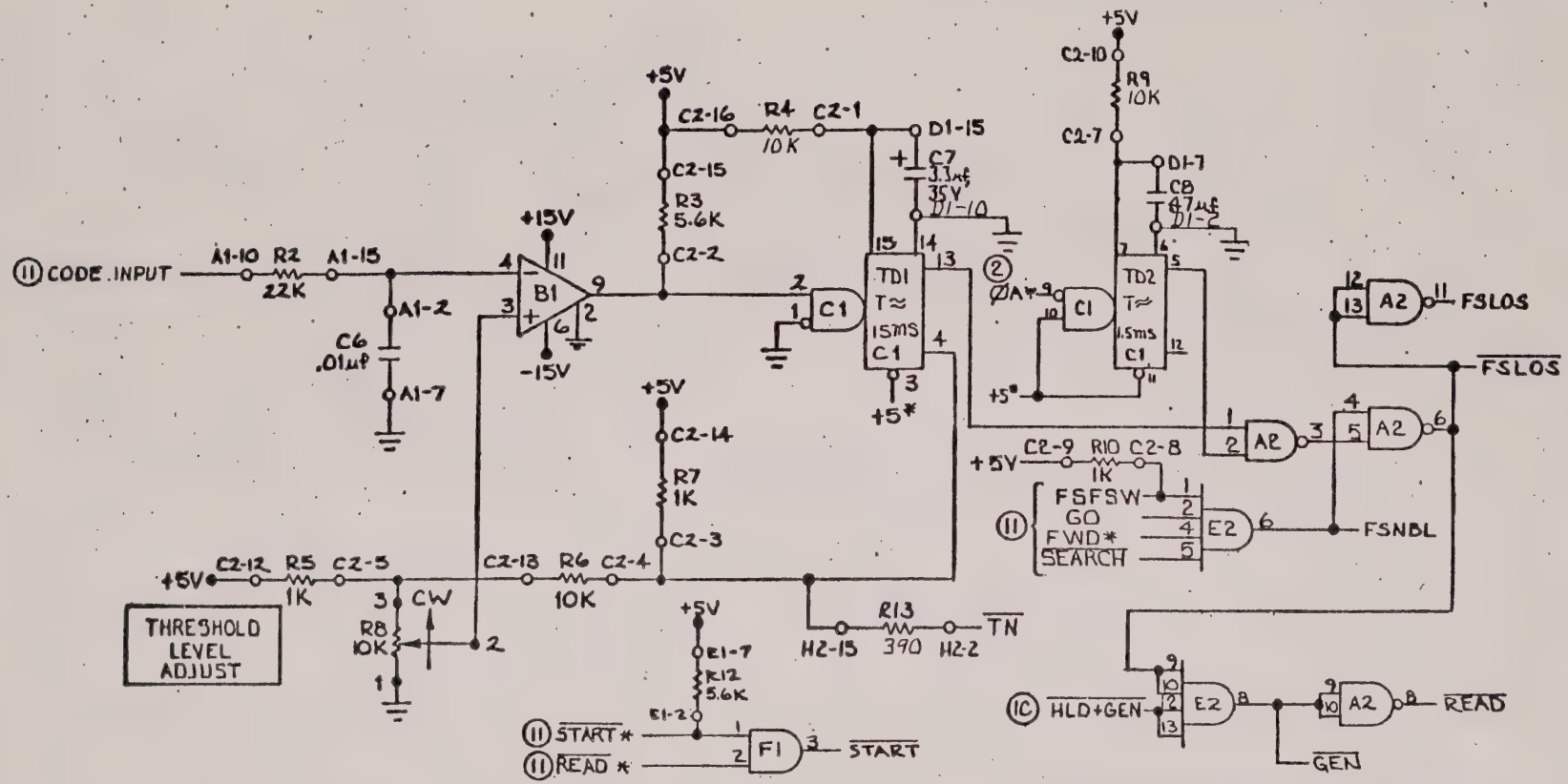
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: .XX ± .010 .XXX ± .005 ANGLES ± 1/2°

TITLE: ASSEMBLY AID AGC

datum inc.
1383 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

DWN	MILES	5/9/73	DES	RF	6/21/73	SIZE	DWG NO.	REV
CHK			ENGR			B	A-16085	H
SCALE	NONE		FSC	31160			SHT OF	



NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCH A TOL: .XX ±.01 .XXX ±.010 ANGLES ± 1/2°

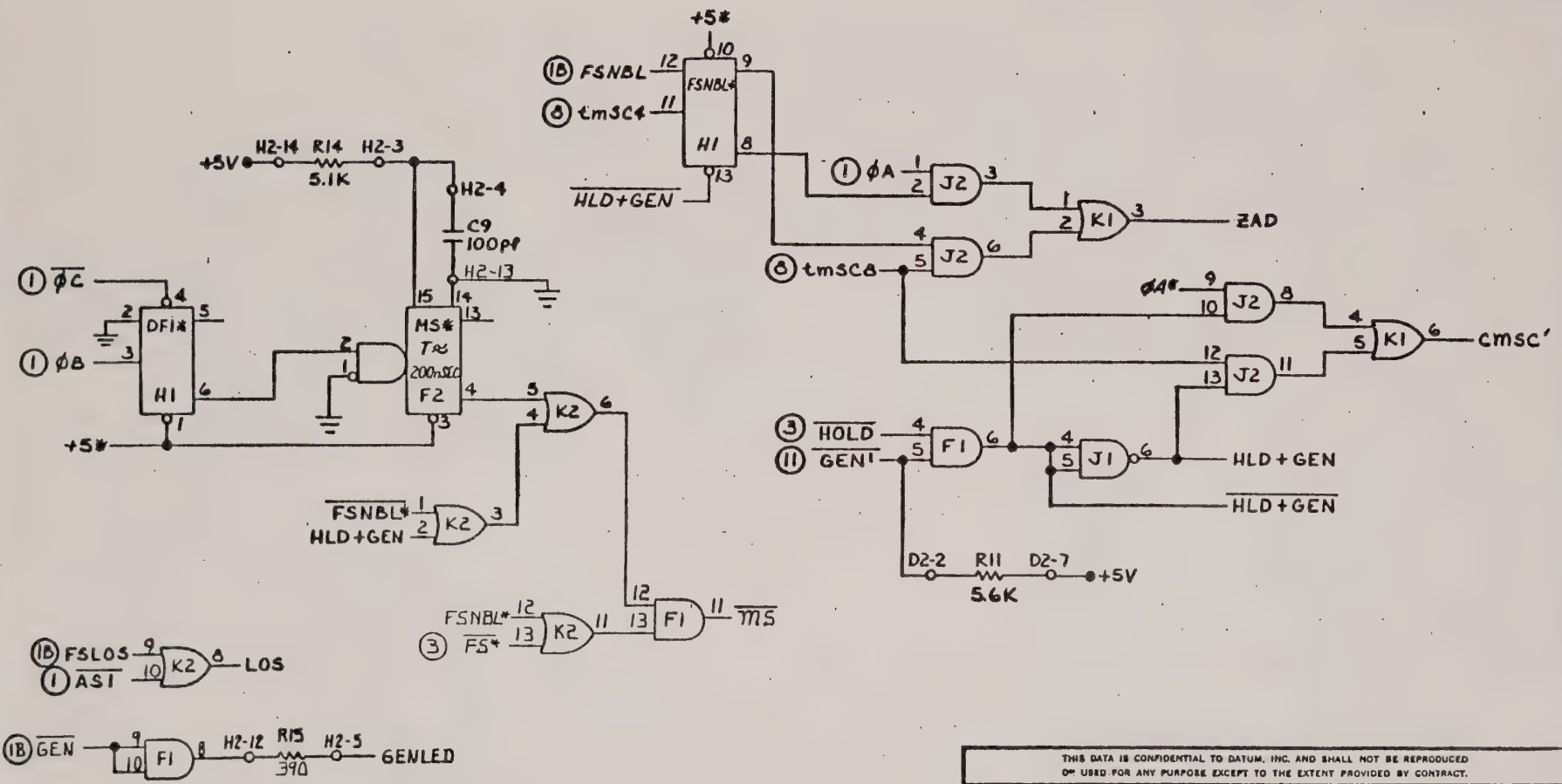
TITLE
FAILSAFE &
(1B) REGENERATE MUX

DENISE 3/17/85
CHK
ENGR GH 3/17/85
SCALE NONE
FSCM 31100

datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM CALIFORNIA

SIZE B
19168
SHT 1 OF 3
REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: XX ± .03, XXX ± .010, ANGLES ± 1/2°

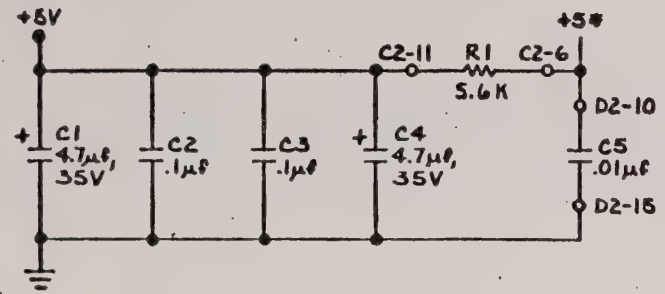
TITLE: FAILSAFE & (1C) REGENERATE MUX

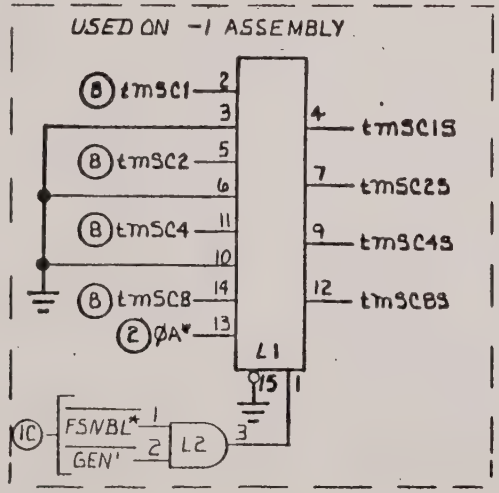
DWN REVISE 5/14/65 | DES | CHK | ENGR 4/14/65 | SCALE NONE | FSC 31160

Datum Inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806

B | 19168 | SIZE | SHT 2 OF 3 | REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





74LS123	C1, F2
74LS00	J1, A2
74LS08	F1, J2, L2
74LS32	K1, K2
74LS74	H1
74LS21	E2
74LS157	L1
LM311D	B1
DEVICE TYPE	REF. DES.

NOTES: UNLESS OTHERWISE SPECIFIED

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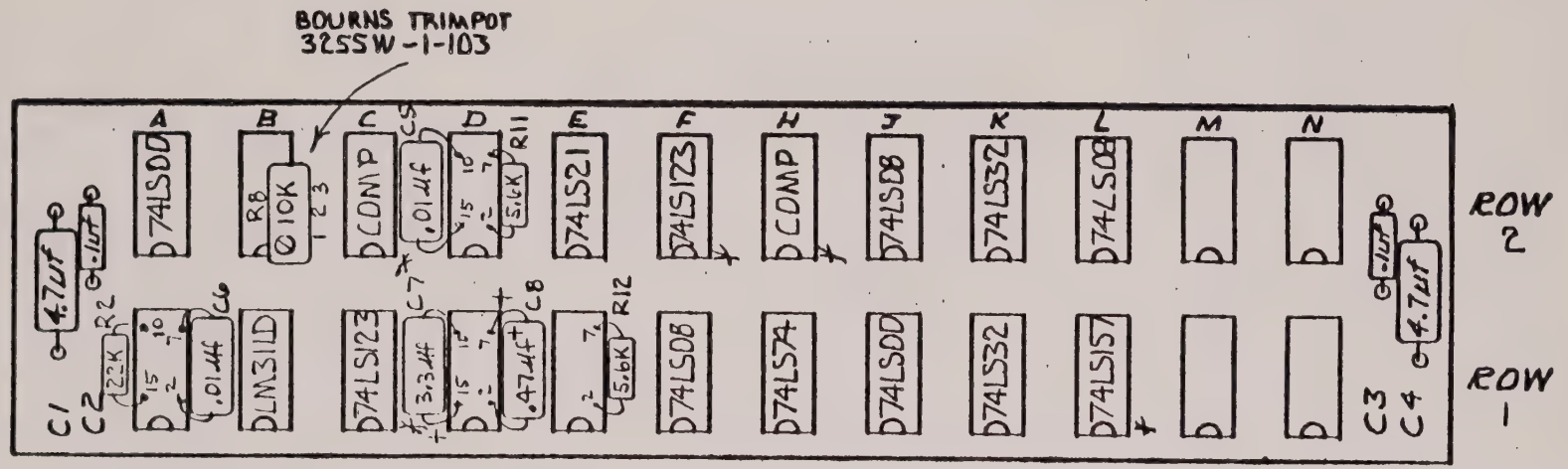
TITLE
FAILSAFE & REGENERATE MUX (ID)

DWN DENISE 2/14/85 DES
CHK ENGR
SCALE NONE FSC 31160

Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

B 19168

SIZE SHT 3 OF 3 REV

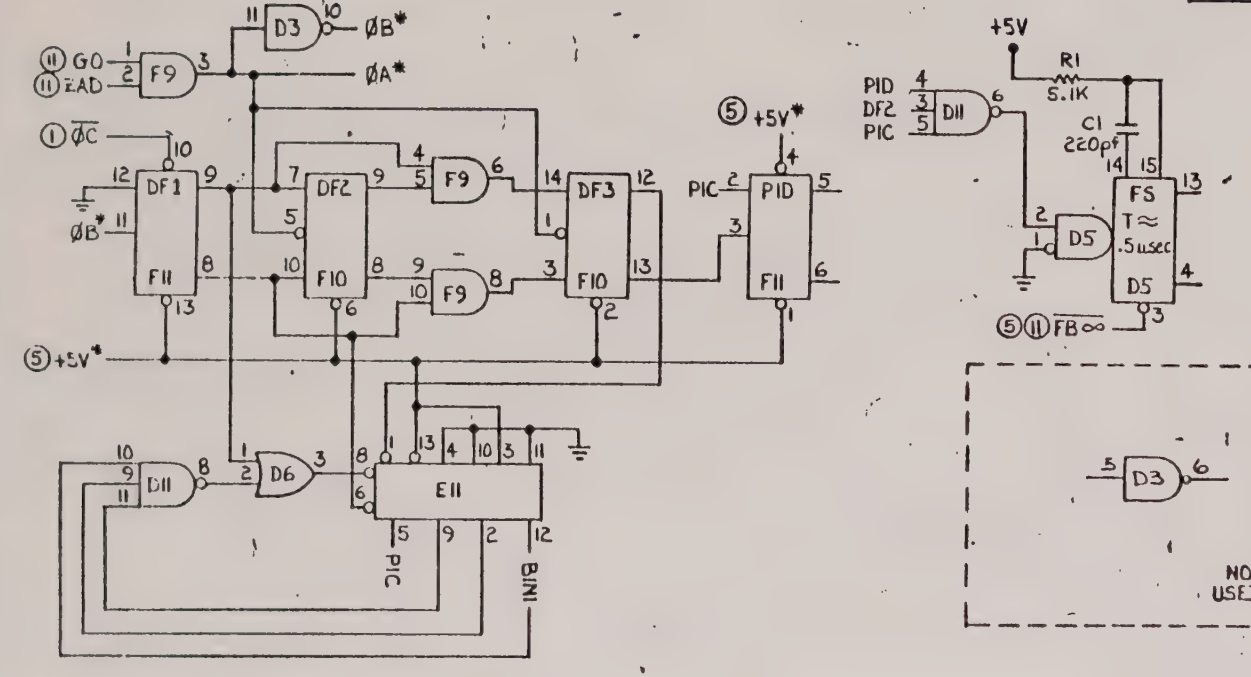


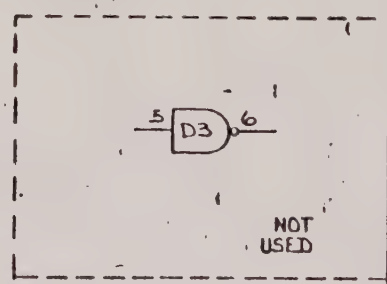
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOL: XX ±.03
XXX ±.010
ANGLES ± 1/2°

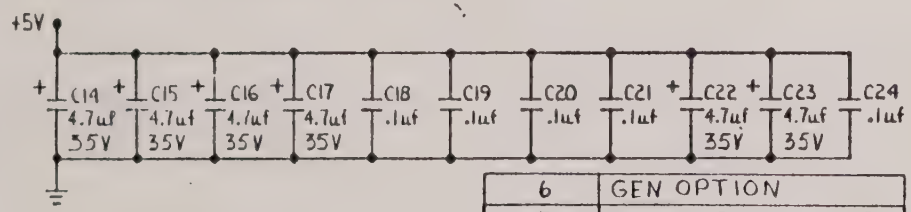
TITLE
FAILSAFE/REGENERATE MUX
19168-1

datum inc.

DWN DENISE	4/19/85	DES		A	A-19168
CHK		ENGR			
SCALE NONE		FSC 31160		SIZE	SHT 1 OF 1 REV







DASH NO	DESCRIPTION
6	GEN OPTION
5	10MHZ CRYSTAL OSC
4	CO251 OSC
3	CO231 OSC
2	EXT OSC
1	DAYS
—	BASIC S-M-H

-L ASSY LOW POWER IC'S

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

PART NO	MFR	REF DES
899-1-RGK	BECKMAN	C6, C8
LM311D	NATIONAL	A1
MC12061F	MOTOROLA	D1
9374-DC	FAIRCHILD	A2-A10
N8281A	SIGNETICS	C10, E11
N8280A	SIGNETICS	E5, F4-F7, C1
N7486A	↕	C3, D8
N7473A	↕	E10
N7442B	SIGNETICS	E6
SN7432N	T.I.	D6
N7411A	SIGNETICS	C9
N7410A	↕	D11
N7408A	↕	D9, F8, F9
N7404A	↕	D3
N7400A	SIGNETICS	D2, D10, A11
SN74156N	T.I.	C5, C7
SN7474N	↕	E9, F11
SN7425N	↕	E8
SN74194N	↕	C2
SN74192N	↕	B2-B10, E4
SN74157N	↕	C4, D7, E7
SN74123N	↕	D5, B11
SN74H106N	↕	D4
SN74H103N	T.I.	F10
SN74122N	TI	C11

PART NO	MFR	REF DES

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
XX ± .03
XXX ± .010
TOL. ANGLES ± 1/2°

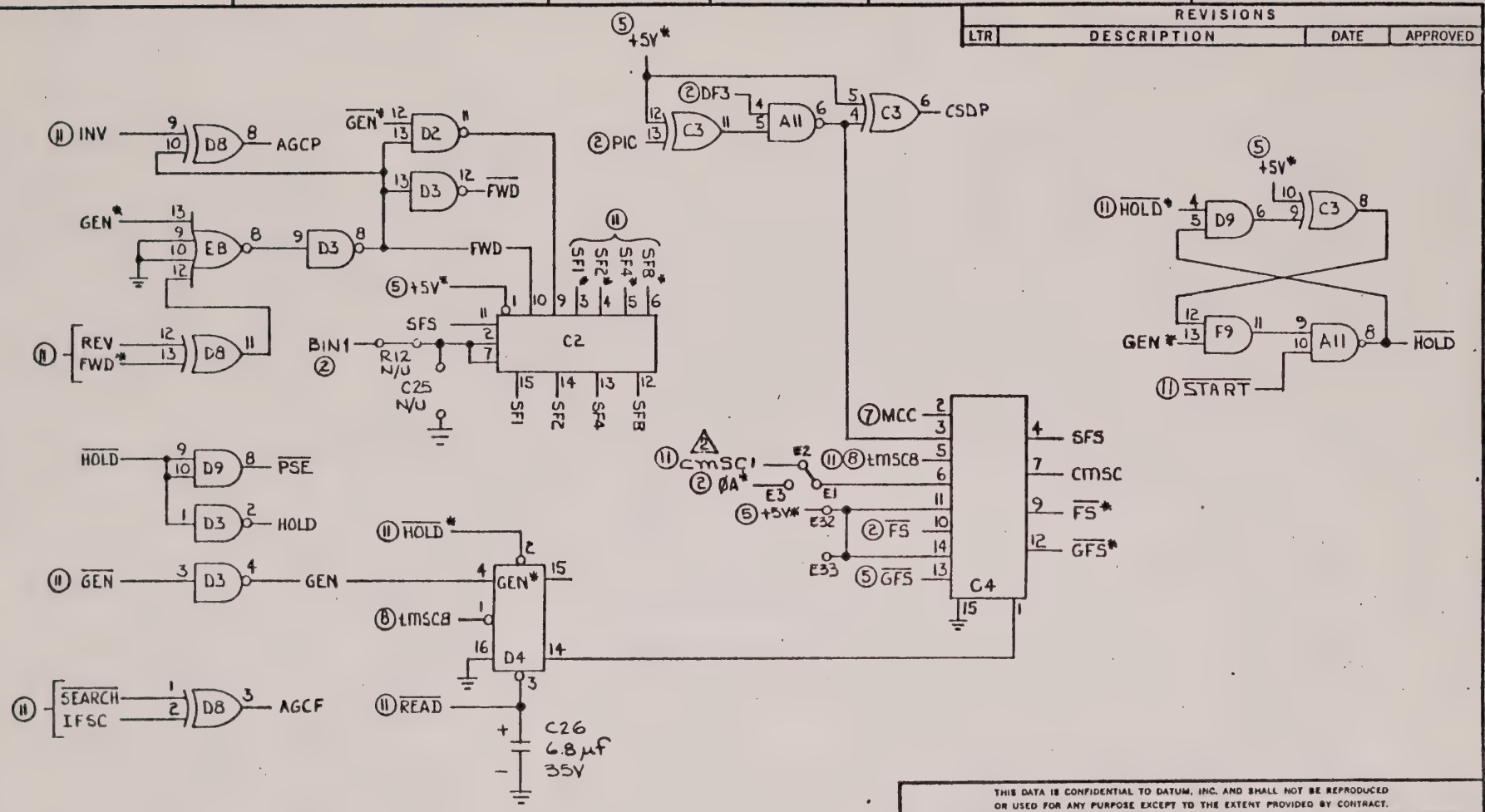
TITLE FAILSAFE IRIG BASIC (2) (DECODER)

DRN JOHN 8/11/81 | CHK | SCALE NONE | DES | ENG

datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

SIZE B | 18256 | REV

SHT 1 OF 8



⚠2 WITH FAILSAFE OPTION, REMOVE JUMPER BETWEEN E1 AND E3, JUMPER E1 TO E2.

NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL .XX ± .010 .XXX ± .005 ANGLES ± 1/2°

TITLE
IRIG BASIC
(3) (MODE CONTROL)

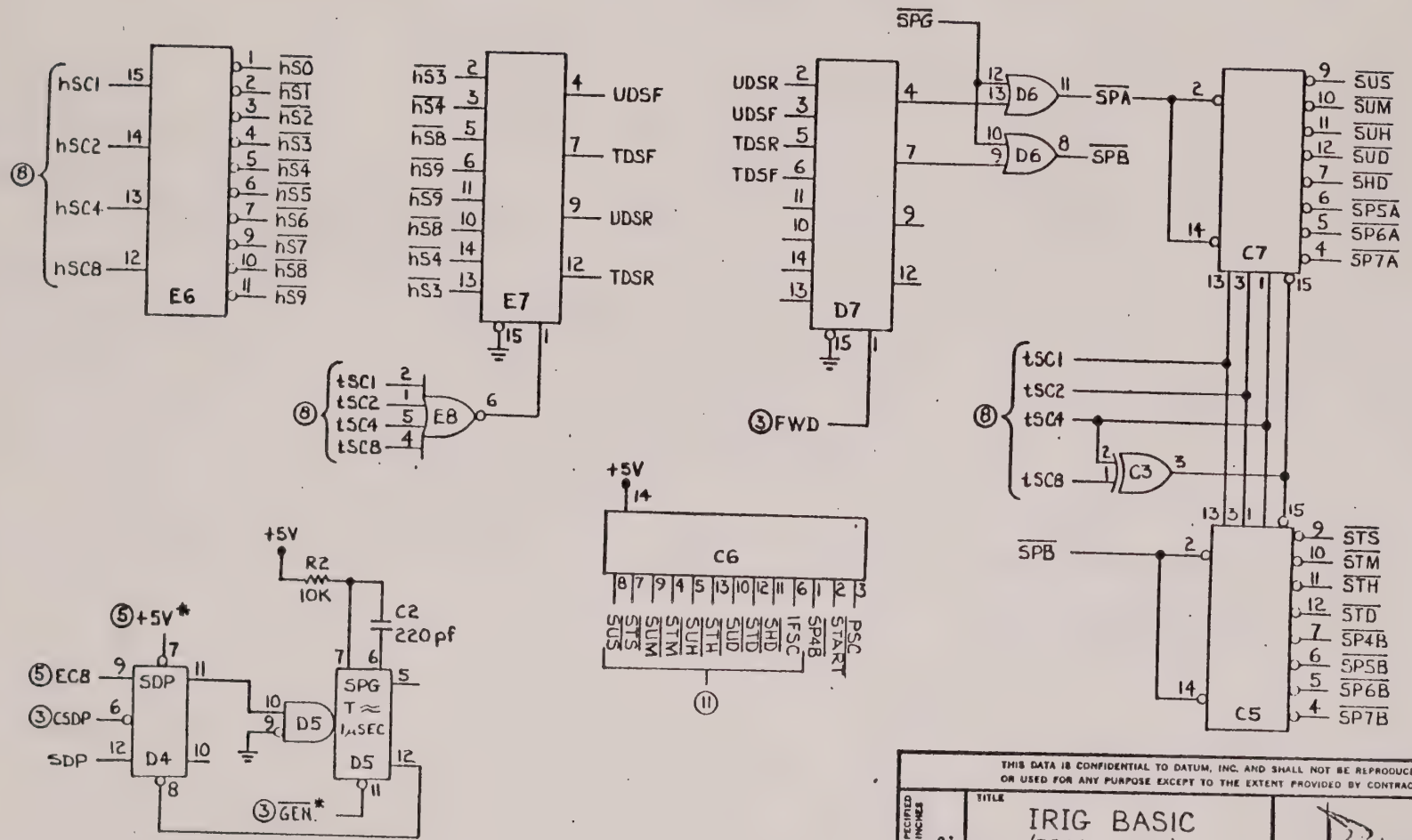
DWN JOHN 8/17/81 DES
CHK
SCALE NONE FSC 31160

Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

B 18256

SIZE SHT 2 OF 8

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL .XX ± .03 .XXX ± .010 ANGLES ± 1/2°

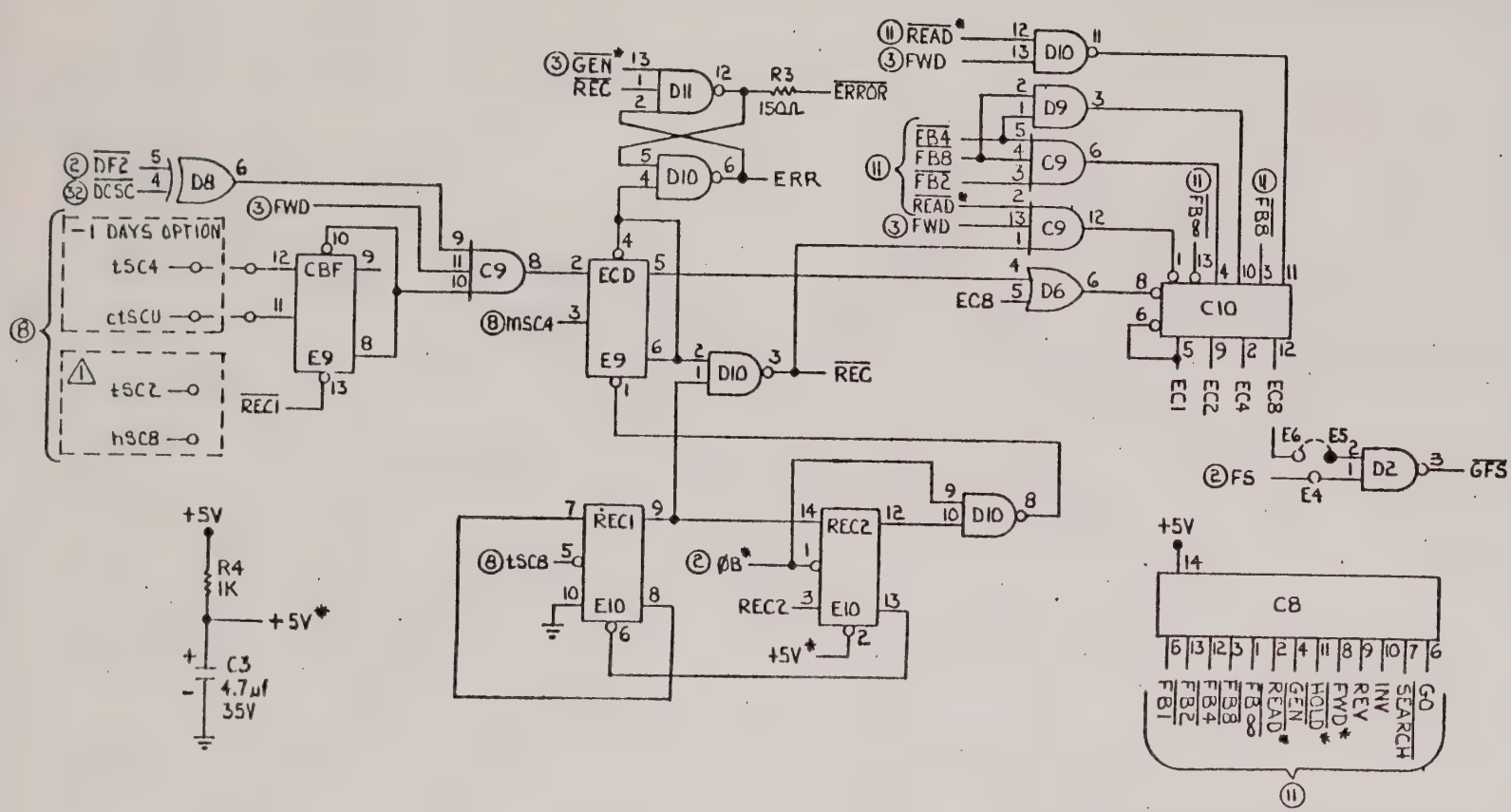
TITLE: IRIG BASIC (SCAN LOGIC) (4)

datum inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806

DWN	CHK	DES	SCALE	FSC	SIZE	SHT
JOHN 8/17/81			NONE	31160	B	3 OF 8

18256

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



⚠ IF DAYS OPTION IS NOT SUPPLIED:
E9-12 IS CONNECTED TO tSC2
E9-11 IS CONNECTED TO hSC8

NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: .XX ±.03 .XXX ±.010 ANGLES ± 1/2°

TITLE: IRIG BASIC (SYNC MODE) (5)

DWN JOHN 8/17/81 ENG
CHK
SCALE NONE
3116

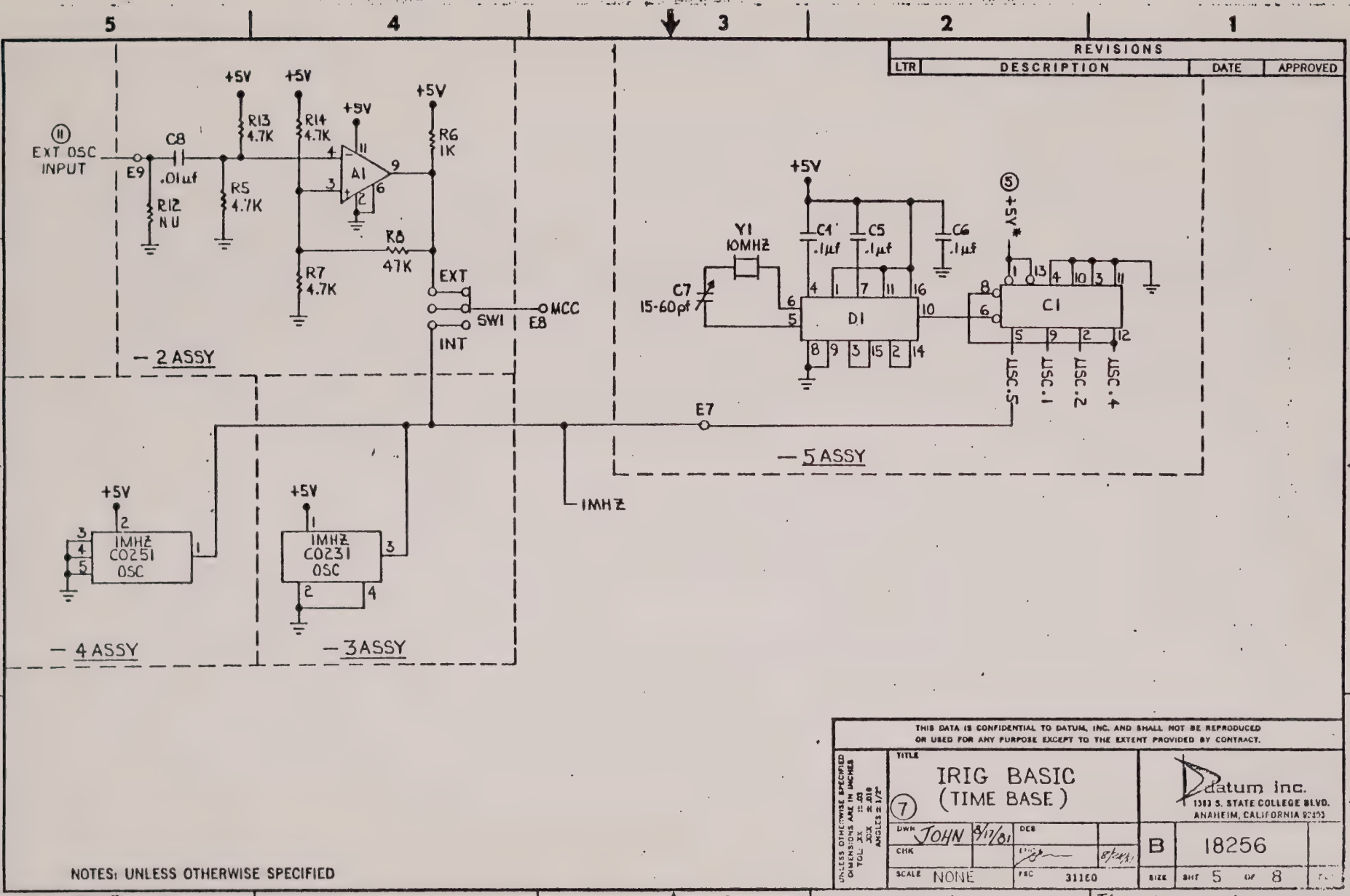
Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

B 18256

SIZE SHT 4 OF 8

T/E 16543

DIET2GEN 1MM-10


5
4
3
2
1
D
C
B
A
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
(11) EXT OSC INPUT
E9
C8 .01µf
R12 NU
R5 4.7K
R13 4.7K
R14 4.7K
R7 4.7K
R8 47K
R6 1K
+5V
A1
EXT
SW1
INT
MCC
E8
— 2 ASSY
Y1 10MHZ
C7 15-60pf
C4 .1µf
C5 .1µf
C6 .1µf
D1
C1
(5) +5V*
USC.5
USC.1
USC.2
USC.4
E7
— 5 ASSY
1MHZ
1MHZ C0251 OSC
1MHZ C0231 OSC
— 4 ASSY
— 3 ASSY
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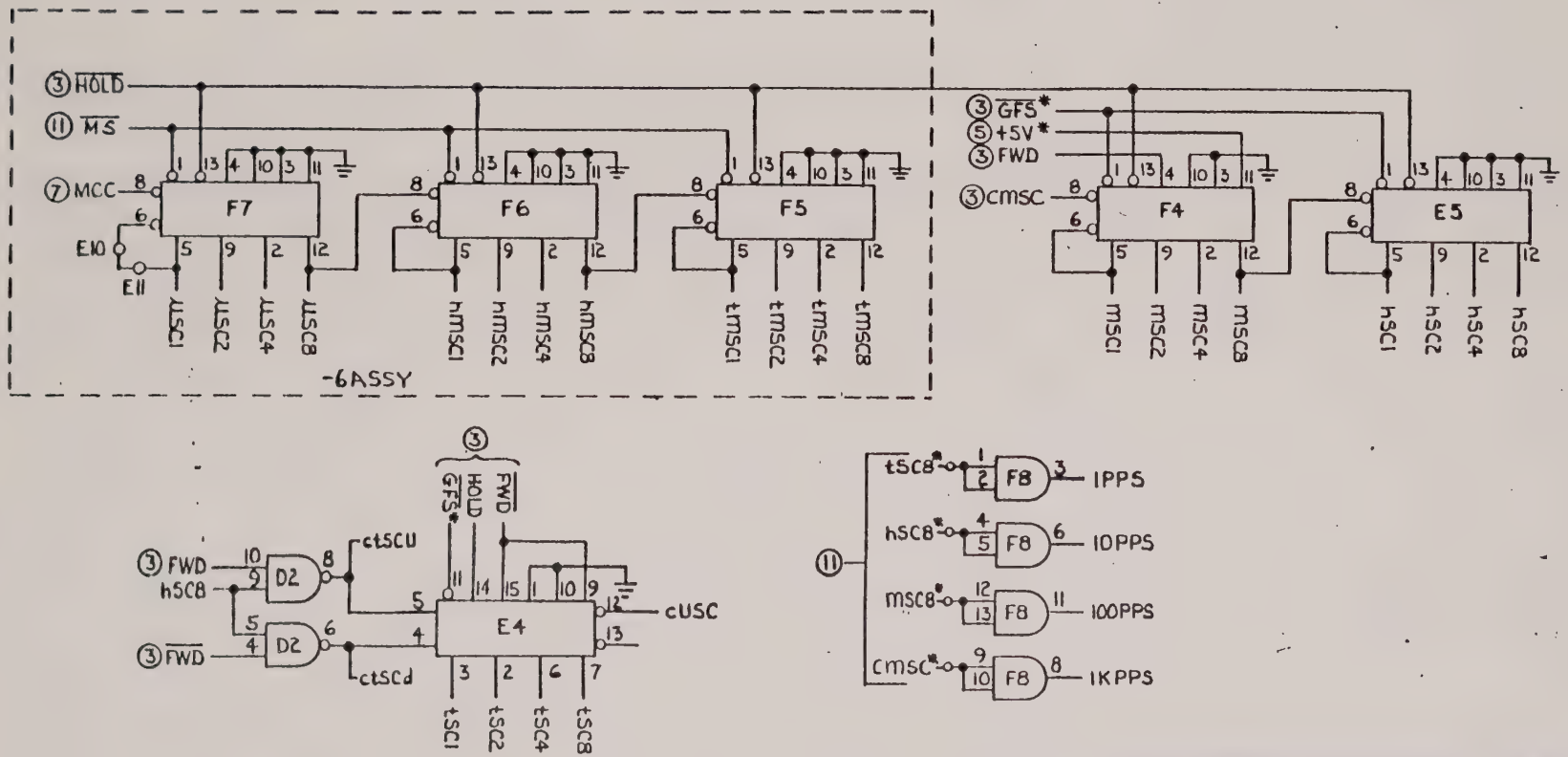
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOL .XX ± .03
.XXX ± .010
ANGLES ± 1/2°
TITLE
IRIG BASIC (TIME BASE)
(7)
DWN JOHN 8/11/81
CHK
SCALE NONE
FSC 31180
Datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92803
B
18256
SIZE
SHT 5 OF 8
NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



NOTES: UNLESS OTHERWISE SPECIFIED

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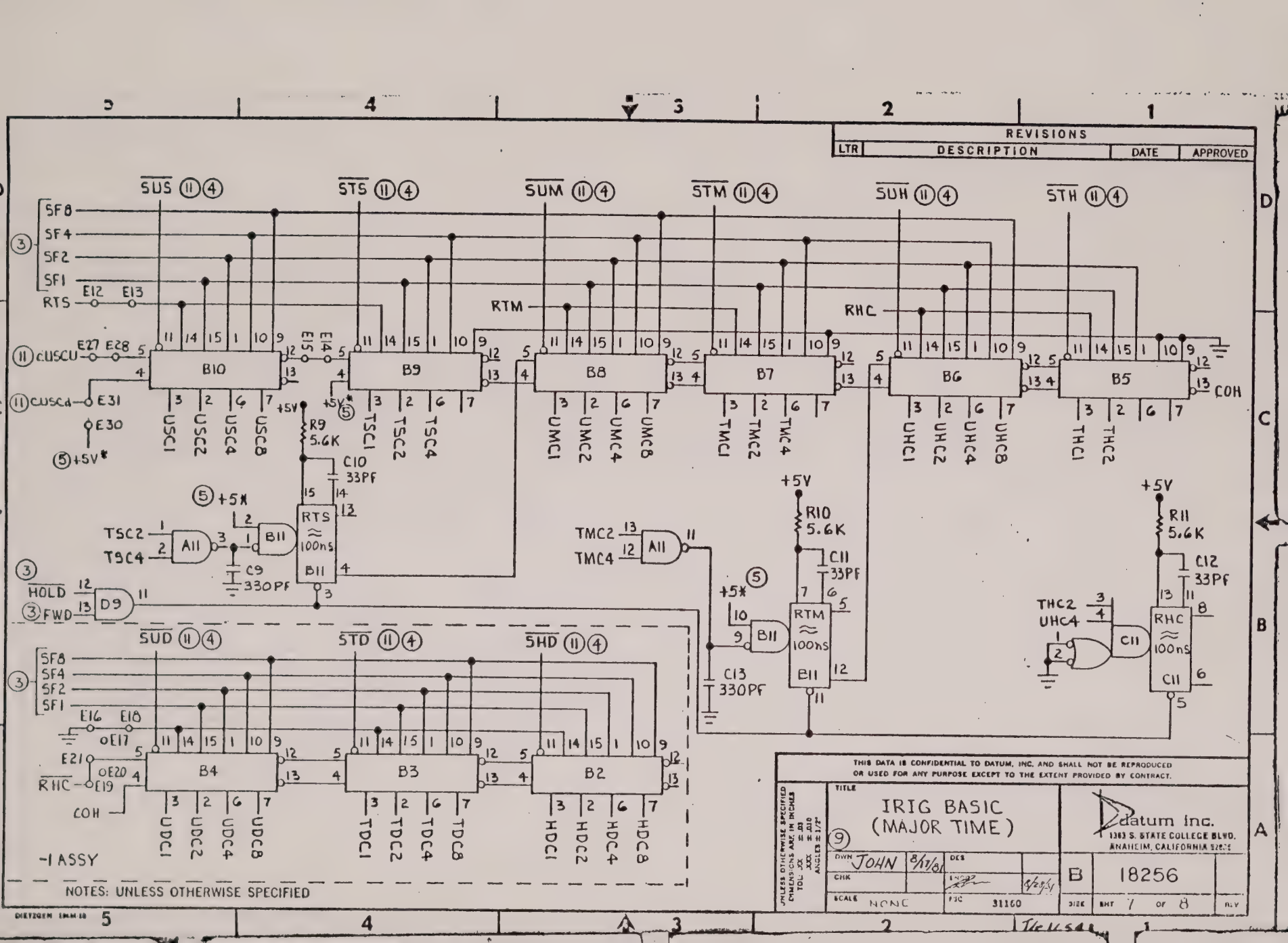
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL .XX ± .01 .XXX ± .010 ANGLES ± 1/2°

TITLE
IRIG BASIC
⑧ (MINOR TIME)

datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

DWN JOHN 9/17/81	DES		B 18256
CHK	ENGR	4/23/82	
SCALE NONE	FSC 31160		SHT 6 OF 9 REV


REVISIONS
LTR DESCRIPTION DATE APPROVED
SUS ⑪④
STS ⑪④
SUM ⑪④
STM ⑪④
SUH ⑪④
STH ⑪④
SF8
SF4
SF2
SF1
RTS
RTM
RHC
E12 E13
E14 E15
E27 E28
E31
E30
⑪CUSCU
⑪CUSC4
⑤+5V*
B10
B9
B8
B7
B6
B5
USC1 USC2 USC4 USC8
TSC1 TSC2 TSC4
UMC1 UMC2 UMC4 UMC8
TMC1 TMC2 TMC4
UHC1 UHC2 UHC4 UHC8
THC1 THC2
COH
R9 5.6K
C10 33PF
TSC2
TSC4
A11
B11
RTS ≈ 100ns
C9 330PF
HOLD
FWD
D9
TMC2
TMC4
R10 5.6K
C11 33PF
C13 330PF
RTM ≈ 100ns
R11 5.6K
C12 33PF
THC2
UHC4
C11
RHC ≈ 100ns
SUD ⑪④
STD ⑪④
SHD ⑪④
E16 E18
E17
E21
E20
E19
RHC
COH
B4
B3
B2
UDC1 UDC2 UDC4 UDC8
TDC1 TDC2 TDC4 TDC8
HDC1 HDC2 HDC4 HDC8
-1 ASSY
NOTES: UNLESS OTHERWISE SPECIFIED
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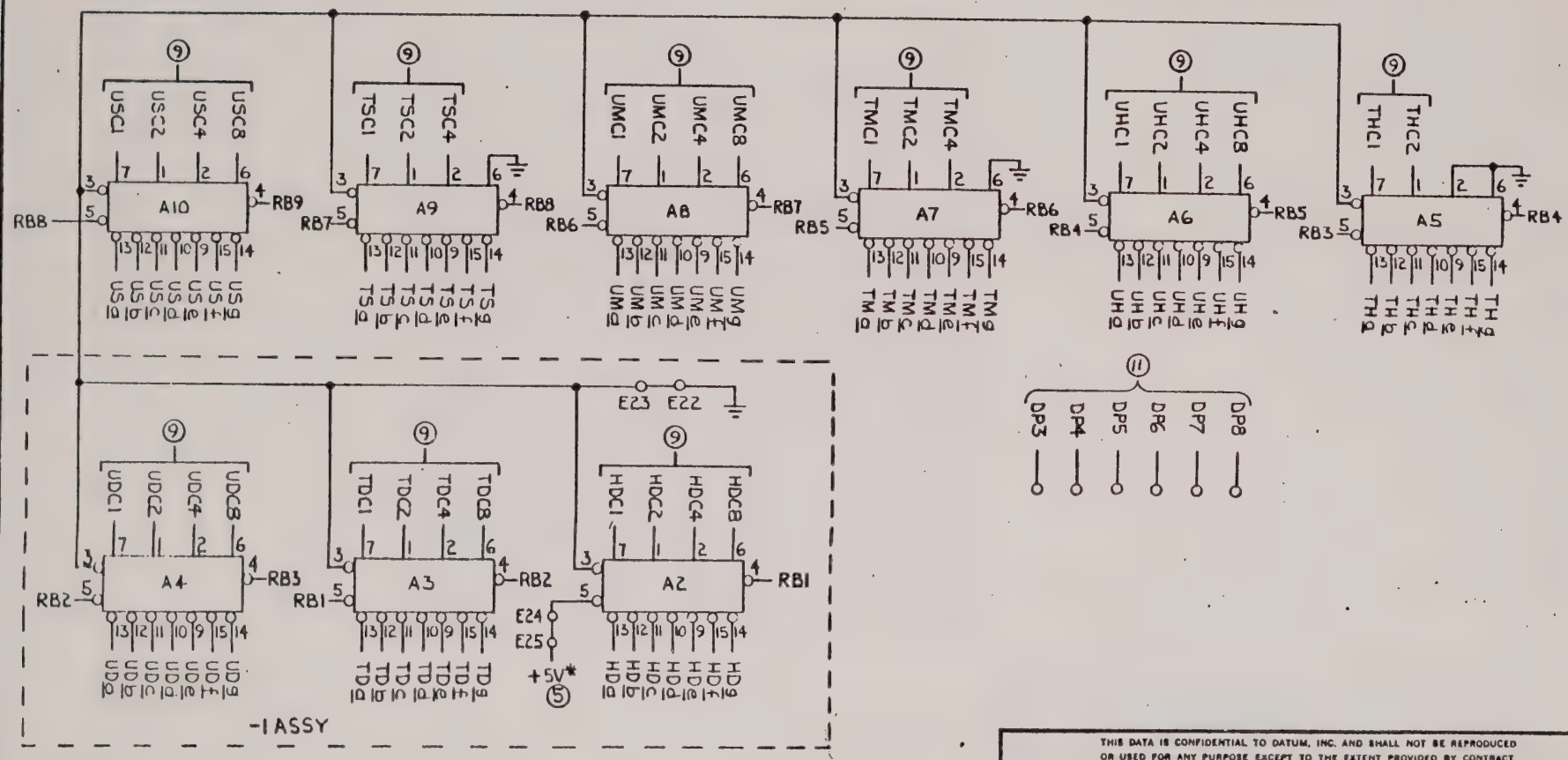
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOL .XX ±.03
.XXX ±.010
ANGLES ±1/2°
TITLE
IRIG BASIC (MAJOR TIME)
⑨
DWN JOHN 8/11/81
CHK
DES
ENGR
MFG
QUAL
SCALE NONE
FSC 31160
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
SIZE B
18256
SHT 1 OF 8
REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL .XX ± .03 .XXX ± .010 ANGLES ± 1/2°

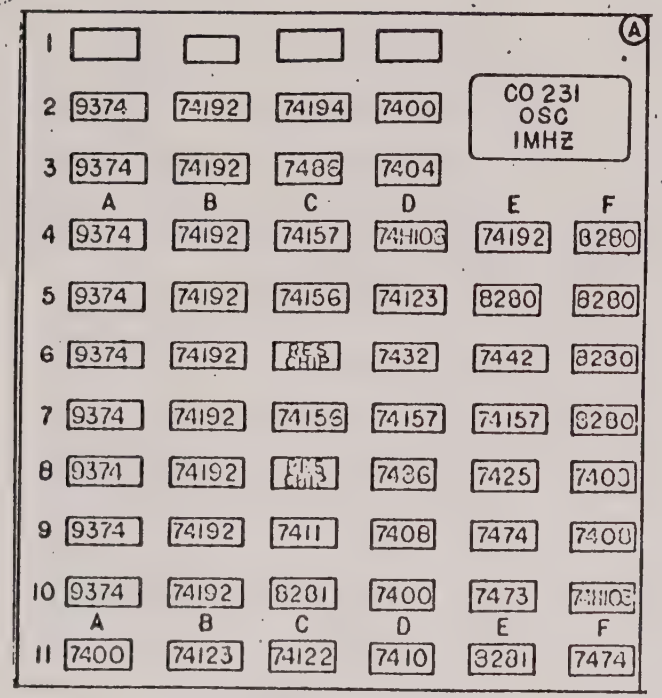
TITLE: IRIG BASIC (10) (DISPLAY DRIVERS)

DWN JOHN 8/17/81 | DES | CHK | ENGR | SCALE NONE | FSC 31160

Datum Inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806

B | 18256 | SIZE | SHT 8 OF 8 | REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: XX ± .010 XXX ± .005 ANGLES ± 1/2°

TITLE: IRIG BASIC

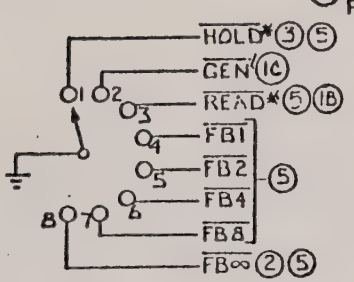
DWN: DENISE 5/3/84 | DES: | CHK: | ENGR: 11/11

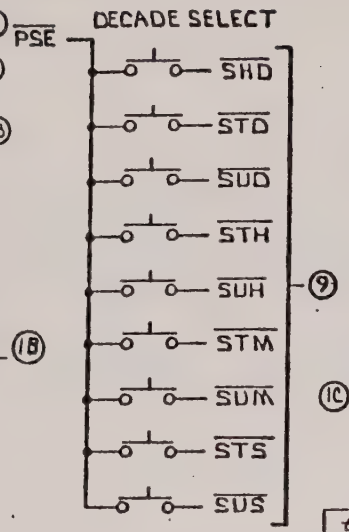
SCALE: NONE | FSC: 31160 | SIZE: B | A-18256 | SHT 1 OF 1 | REV

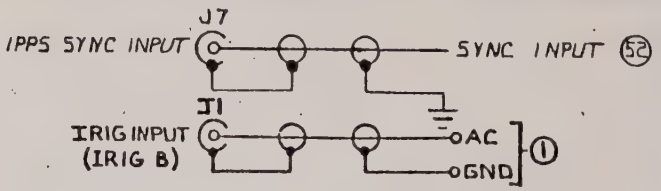
datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

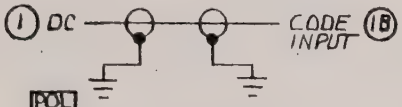
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

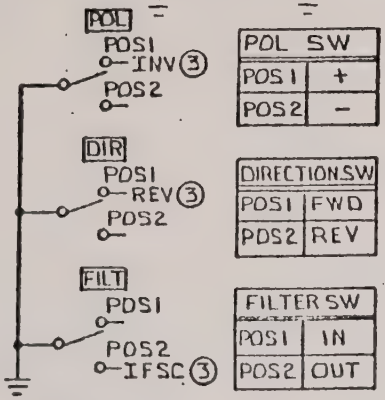
POS	MODE SW
1	HOLD
2	GEN
3	READ
4	FB1
5	FB2
6	FB4
7	FB8
8	FB∞







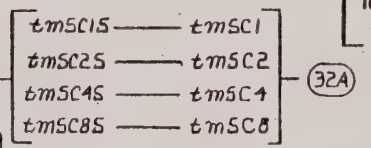


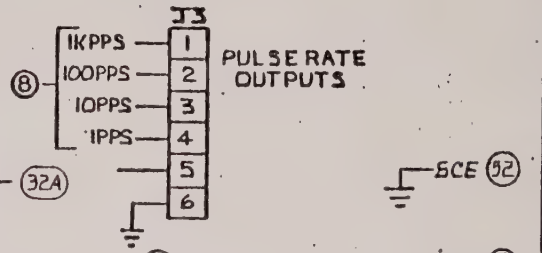


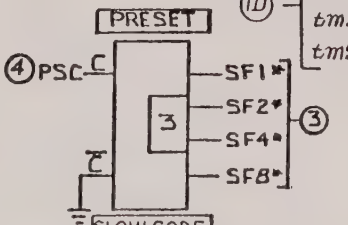
POL SW	
POS1	+
POS2	−

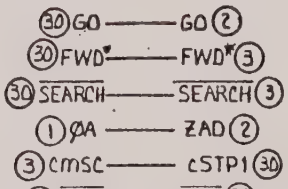
DIRECTION SW	
POS1	FWD
POS2	REV

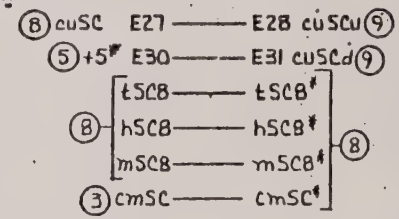
FILTER SW	
POS1	IN
POS2	OUT

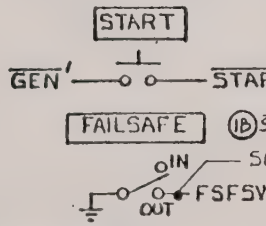


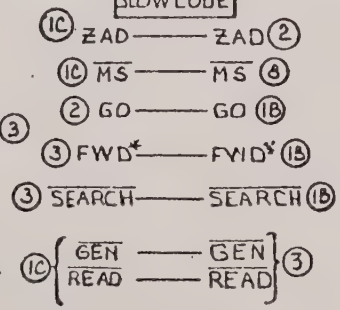












(18) START — START (3)

ANY TERM REFERENCED TO THIS DRAWING AND NOT SHOWN HERE IS NOT USED IN THIS CONFIGURATION.

NOTES: UNLESS OTHERWISE SPECIFIED

THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES: FRACT ± .03 .XX ± .03 .XXX ± .010 ANGLES ± 1°

TITLE: SWITCH & CONTROL LOGIC (9300-7368) (11)

DENISE 3/12/85 — CHK — DES — ENG 6H 9/16/85 — MFG — QA — SCALE NONE — FSCM 21100

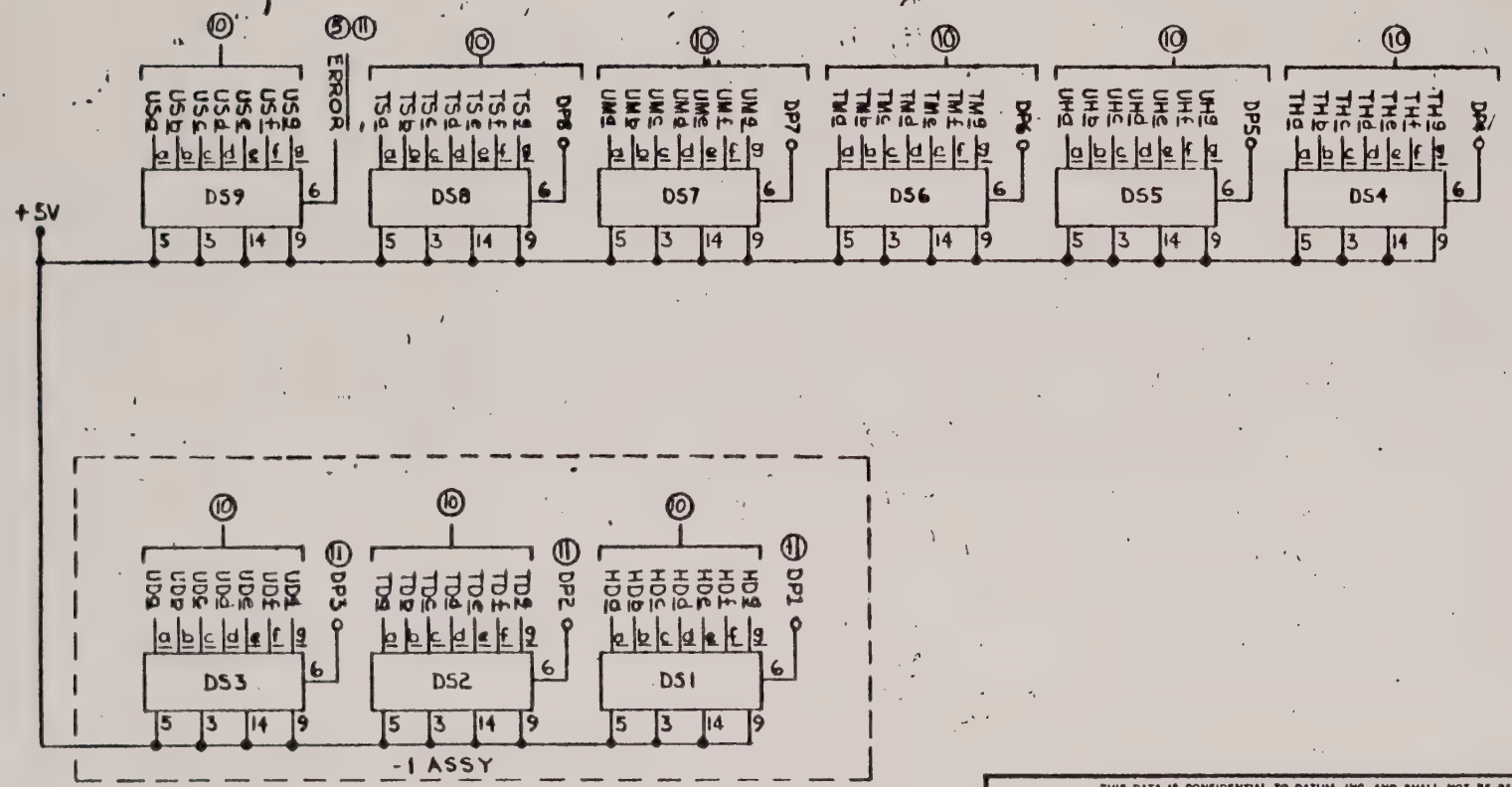
datum inc. 3363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806

B | 9300-8793 | SIZE | SHT 1 OF 1 | REV

DIETZGEN 1NM 13

T/F 9300-8719 2

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
–	ADDED -4, -5, -6	10-21-71	CC



-5 LEDS ARE YELLOW, H/P 5082-7660
-4 LEDS ARE GREEN, H/P 5082-7670
-3 LEDS ARE FAIRCHILD FND-507
-2 LEDS ARE MONSANTO MAN6A
1. LEDS ARE H/P 5082-7650

-6 LEDS ARE MONSANTO, 6660

NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOL: XX ± .03
XXX ± .010
ANGLES ± 1/2°

TITLE: LED DISPLAY (12)

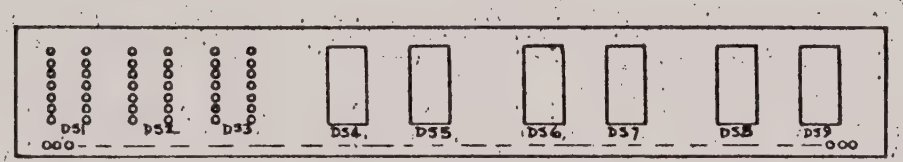
DWN IC	6/26/74	DES	
CHK	7/2/74	ENGR	11/14/74
SCALE NONE		FSC 31160	

Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

B 16549

SIZE | SHT 1 OF 1 | REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



PC BD # 170937

NOTES: UNLESS OTHERWISE SPECIFIED

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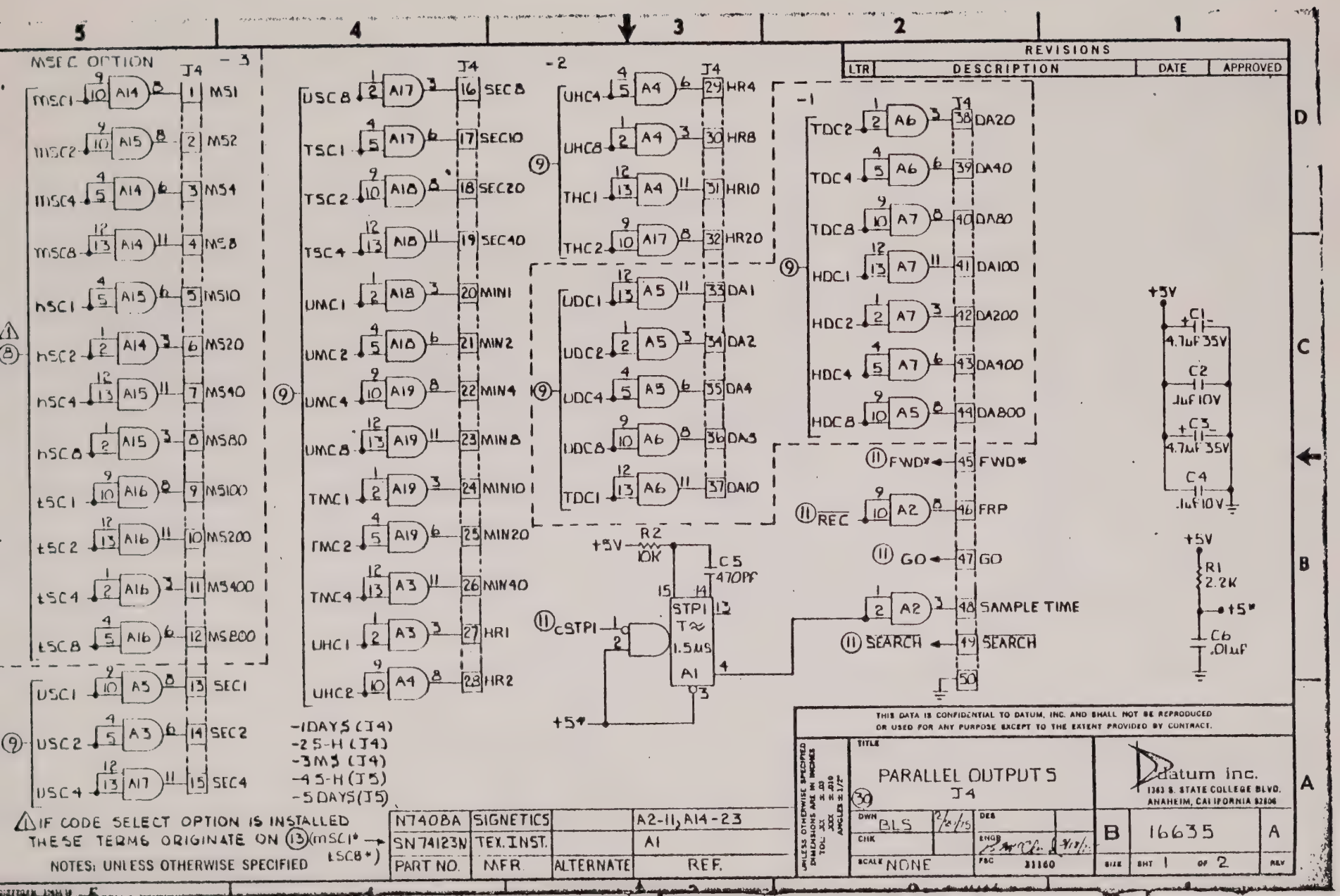
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: .XX ± .03 .XXX ± .010 ANGLES ± 1/2°

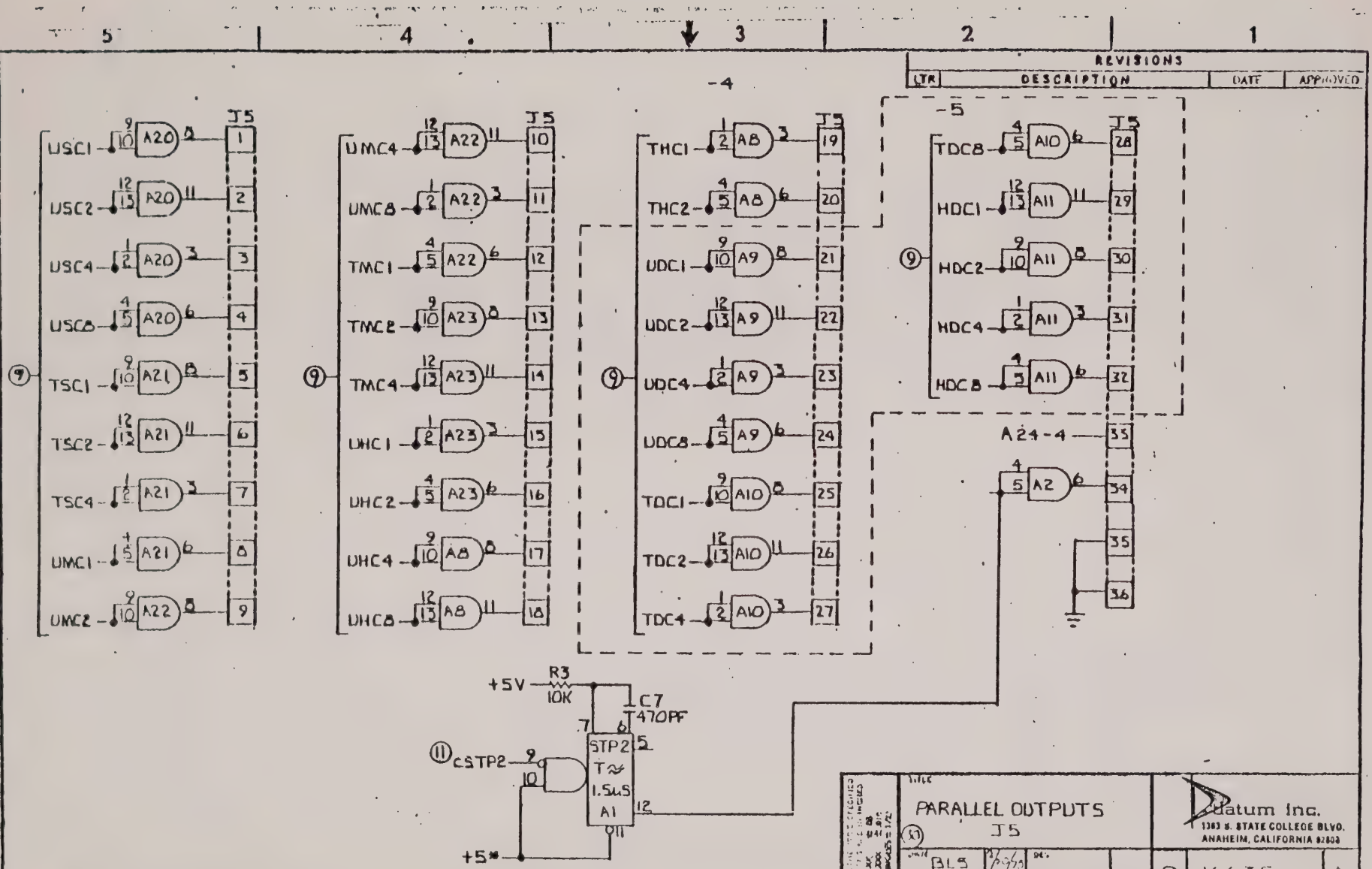
TITLE: LED DISPLAY (S-M-H)

datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

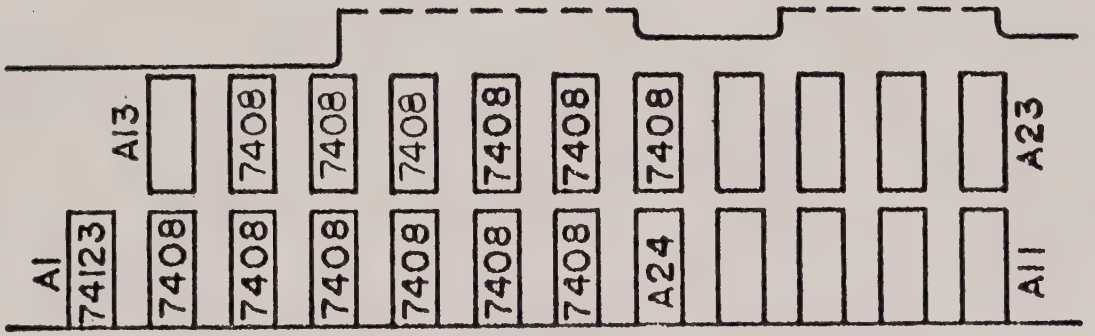
DWN	CARY	3/9/76	DES	
CHK			ENGR	
SCALE	FULL		FSC	31160

B | A-16549 | SHT 1 OF 1 | REV


5
4
3
2
1
MSEC OPTION -3
J4
MSC1 9 10 A14 8 1 MS1
MSC2 9 10 A15 8 2 MS2
MSC4 4 5 A14 6 3 MS4
MSC8 12 13 A14 11 4 MS8
MSC10 4 5 A15 6 5 MS10
MSC20 1 2 A14 3 6 MS20
MSC40 12 13 A15 11 7 MS40
MSC80 1 2 A15 3 8 MS80
MSC100 9 10 A16 8 9 MS100
MSC200 12 13 A16 11 10 MS200
MSC400 1 2 A16 3 11 MS400
MSC800 4 5 A16 6 12 MS800
USC1 9 10 A5 8 13 SEC1
USC2 4 5 A3 6 14 SEC2
USC4 12 13 A17 11 15 SEC4
-3
J4
USC8 1 2 A17 3 16 SEC8
TSC1 4 5 A17 6 17 SEC10
TSC2 9 10 A18 8 18 SEC20
TSC4 12 13 A18 11 19 SEC40
UMC1 1 2 A18 3 20 MIN1
UMC2 4 5 A18 6 21 MIN2
UMC4 9 10 A19 8 22 MIN4
UMC8 12 13 A19 11 23 MIN8
TMC1 1 2 A19 3 24 MIN10
TMC2 4 5 A19 6 25 MIN20
TMC4 12 13 A3 11 26 MIN40
UHC1 1 2 A3 3 27 HR1
UHC2 9 10 A4 8 28 HR2
-2
J4
UHC4 4 5 A4 6 29 HR4
UHC8 1 2 A4 3 30 HR8
THC1 12 13 A4 11 31 HR10
THC2 9 10 A17 8 32 HR20
UDC1 12 13 A5 11 33 DA1
UDC2 1 2 A5 3 34 DA2
UDC4 4 5 A5 6 35 DA4
UDC8 9 10 A6 8 36 DA8
TDC1 12 13 A6 11 37 DA10
-1
J4
TDC2 1 2 A6 3 38 DA20
TDC4 4 5 A6 6 39 DA40
TDC8 9 10 A7 8 40 DA80
HDC1 12 13 A7 11 41 DA100
HDC2 1 2 A7 3 42 DA200
HDC4 4 5 A7 6 43 DA400
HDC8 9 10 A5 8 44 DA800
FWD* 45 FWD*
REC 9 10 A2 8 46 FRP
GO 47 GO
1 2 A2 3 48 SAMPLE TIME
SEARCH 49 SEARCH
50
CSTPI 1 2
STPI T≈ 1.5MS A1 15 14 12 4 3
R2 10K
+5V
C5 470PF
+5V
C1 4.7uF 35V
C2 1uF 10V
C3 4.7uF 35V
C4 .1uF 10V
+5V
R1 2.2K
+5*
C6 .01uF
-1DAYS (J4)
-2 S-H (J4)
-3 MS (J4)
-4 S-H (J5)
-5 DAYS (J5)
IF CODE SELECT OPTION IS INSTALLED THESE TERMS ORIGINATE ON (13) (MSC1* → LSC8*)
NOTES: UNLESS OTHERWISE SPECIFIED
N7408A SIGNETICS A2-11, A14-23
SN74123N TEX. INST. A1
PART NO. MFR. ALTERNATE REF.
REVISIONS
LTR DESCRIPTION DATE APPROVED
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: XX ±.03 XXX ±.010 ANGLES ±1/2°
TITLE
PARALLEL OUTPUTS
J4
(30)
DWN BLS 2/2/75
CHK
SCALE NONE
DES
ENGR
PAC 31160
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
B 16635 A
SIZE SHT 1 OF 2 REV
D
C
B
A


5
4
3
2
1
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
-4
-5
J5
USC1
USC2
USC4
USC8
TSC1
TSC2
TSC4
UMC1
UMC2
UMC4
UMC8
TMC1
TMC2
TMC4
UHC1
UHC2
UHC4
UHC8
THC1
THC2
UDC1
UDC2
UDC4
UDC8
TDC1
TDC2
TDC4
TDC8
HDC1
HDC2
HDC4
HDC8
A24-4
+5V
R3
10K
C7
470PF
CSTP2
STP2
T≈
1.5uS
A1
+5*
PARALLEL OUTPUTS
J5
Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92803
BLS
NONE
B
16635
A
SHT 2 OF 2
NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: .XX ±.03 .XXX ±.010 ANGLES ±1/2°

TITLE: PARALLEL OUTPUT

DWN ESTHER 5/26/83 | DES | |

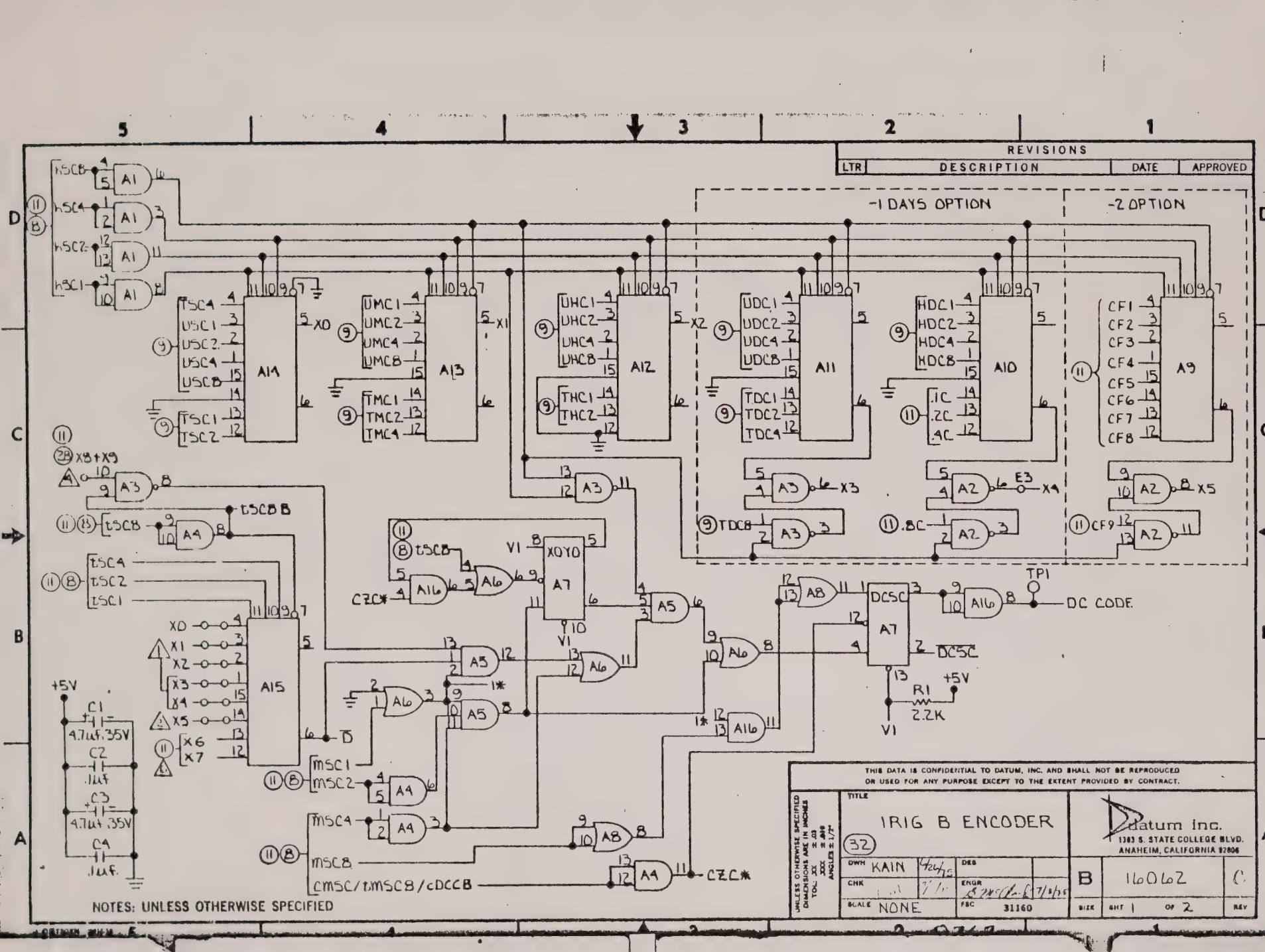
CHK | ENGR | 7/29/83

SCALE NONE | ISC 3A160

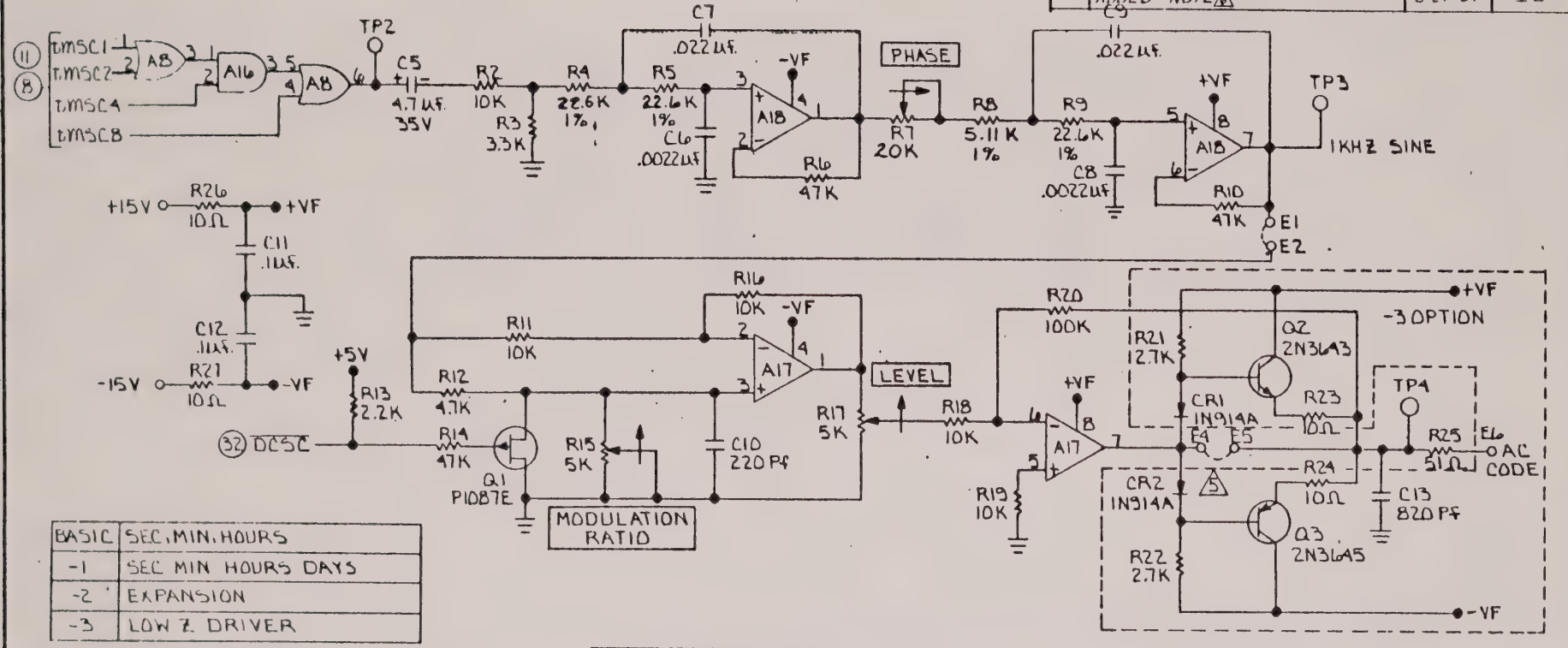
Datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92803

A | A-16635 | SIZE | SHT 1 OF 1 | REV

NOTES: UNLESS OTHERWISE SPECIFIED


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
-1 DAYS OPTION
-2 OPTION
NOTES: UNLESS OTHERWISE SPECIFIED
THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.
TITLE
IRIG B ENCODER
(32)
DWN KAIN
CHK
ENGR
SCALE NONE
FSC 31160
datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
B
160062
C
SIZE
SHT 1 OF 2
REV
DC CODE
TPI
+5V
R1
2.2K
V1
DCSC
CZC*
TSCB B

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	R4 WAS 20.5K PER CO# 2759	2-3-77	[illegible]
—	ADDED (11) REF.'s CF1-CF9 ON-2	11-14-77	CC/[illegible]
B	REVISED PER C.O. #T3755	5-31-79	LS/BR
—	ADDED NOTE 6	3-27-81	IC
C	A7 WAS 74107 PER ECO T4862	6-15-84	IC



BASIC	SEC, MIN, HOURS
-1	SEC MIN HOURS DAYS
-2	EXPANSION
-3	LOW Z. DRIVER

6 GND WHEN C/F SCAN NOT USED

5 REMOVE JUMPER FROM E4-E5 WHEN -3 OPTION IS USED.

4 GROUND WHEN 17 BIT BINARY NOT USED.

3 GROUND PIN 14 WHEN -2 OPTION IS NOT USED.

1 CUT ETCH AND GROUND PINS 1 & 15 WHEN DAYS OPTION IS NOT USED.

NOTES: UNLESS OTHERWISE SPECIFIED

PART NO.	MFR	REF. DES.
N555BV	SIGNETICS	A17, A18
N74151N	T.I.	A9-15
SN74LS107N	TI	A7
N7432A	NATIONAL	A6, 8
N7411A	↓	A5
N7408A	↓	A1, A4, A16
N7400A	NATIONAL	A2, A3

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: XX ± .03, XXX ± .010, ANGLES ± 1/2°

TITLE: IRIG B ENCODER (32A)

DWN KAIN 6/26/75 DES

CHK 7/3/75 ENGR 7/3/75

SCALE NONE FSC 81160

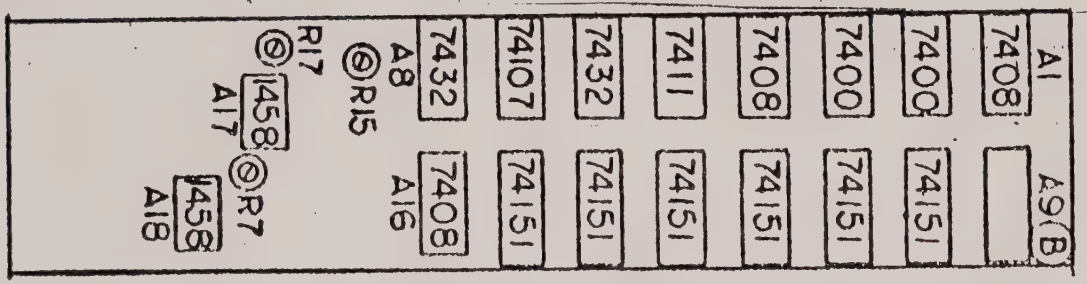
Datum Inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806

B | 16062 | C

SIZE | SHT 2 OF 2 | REV

DIETZGEN 10KM 10

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



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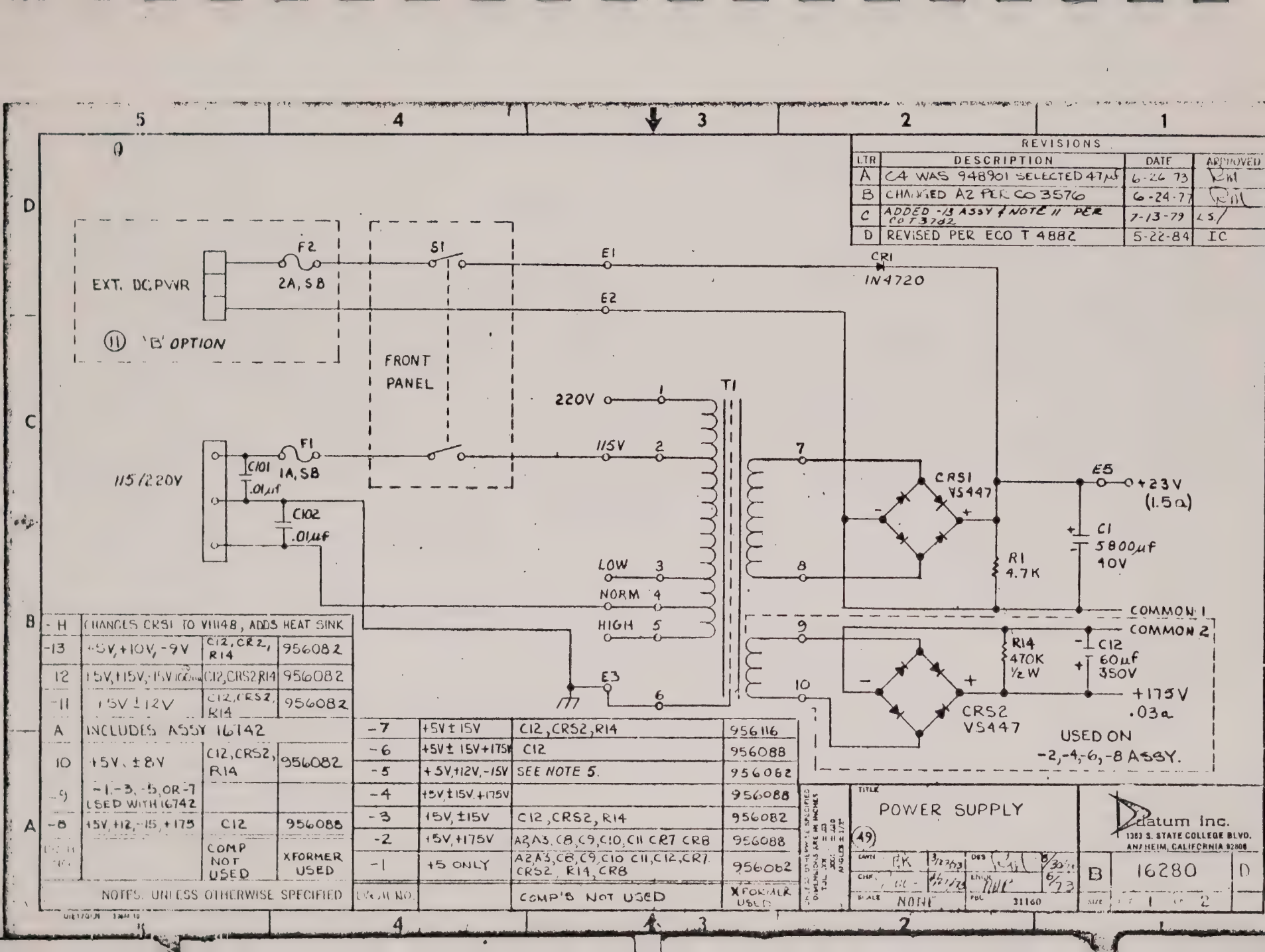
NOTES: UNLESS OTHERWISE SPECIFIED

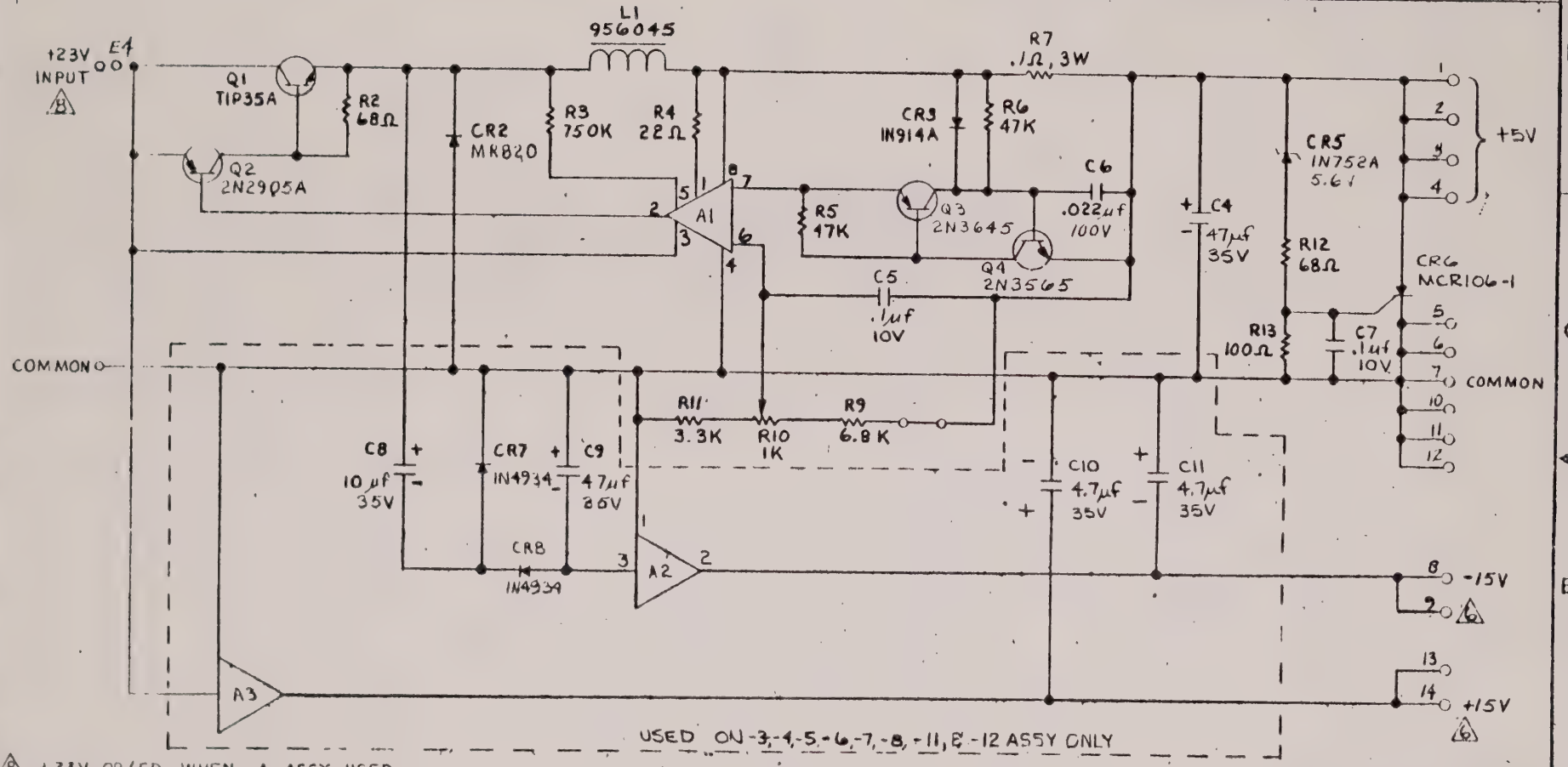
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOL: .XX ±.03
.XXX ±.010
ANGLES ± 1/2°

TITLE
IRIG B ENCODER

Datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

DWN IC	11/3/03	DES		A	A-16062
CHK		ENGR			
SCALE NONE		FSC 31169		SIZE	SHT 1 OF 1 REV


REVISIONS
LTR | DESCRIPTION | DATE | APPROVED
A | C4 WAS 948901 SELECTED 47µf | 6-26-73 |
B | CHANGED A2 PER CO 3576 | 6-24-77 |
C | ADDED -13 ASSY & NOTE 11 PER CO T 3782 | 7-13-79 |
D | REVISED PER ECO T 4882 | 5-22-84 | IC
EXT. DC PWR
F2
2A, SB
S1
E1
E2
CR1
IN4720
(11) 'B' OPTION
FRONT PANEL
220V
115V
T1
115/220V
F1
1A, SB
C101
.01µf
C102
.01µf
LOW
NORM
HIGH
E3
CRS1
VS447
E5
+23V
(1.5a)
C1
5800µf
40V
R1
4.7K
COMMON 1
R14
470K
½W
C12
60µf
350V
+175V
.03a
CRS2
VS447
COMMON 2
USED ON
-2,-4,-6,-8 ASSY.
- H | CHANGES CRS1 TO VI1148, ADDS HEAT SINK
-13 | +5V, +10V, -9V | C12, CR2, R14 | 956082
12 | +5V, +15V, -15V | C12, CRS2, R14 | 956082
-11 | +5V ± 12V | C12, CRS2, R14 | 956082
A | INCLUDES ASSY 16742
10 | +5V, ±8V | C12, CRS2, R14 | 956082
-9 | -1, -3, -5, OR -7 USED WITH 16742
-8 | +5V, +12, -15, +175 | C12 | 956085
COMP NOT USED | XFORMER USED
-7 | +5V ± 15V | C12, CRS2, R14 | 956116
-6 | +5V ± 15V + 175V | C12 | 956088
-5 | +5V, +12V, -15V | SEE NOTE 5. | 956062
-4 | +5V ± 15V, +175V | | 956088
-3 | +5V, ±15V | C12, CRS2, R14 | 956082
-2 | +5V, +175V | A2, A3, C8, C9, C10, C11 CR7 CR8 | 956088
-1 | +5 ONLY | A2, A3, C8, C9, C10, C11, C12, CR7, CR52, R14, CR8 | 956062
ENGR NO. | COMP'S NOT USED | XFORMER USED
NOTES: UNLESS OTHERWISE SPECIFIED
TITLE
POWER SUPPLY
(49)
datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806
B | 16280 | D
SCALE NONE
PBC 31160
SIZE
SHT 1 OF 2



8. +23V OR'ED WHEN -A ASSY USED
7. -10 ASSY A3 IS 7808, A2 IS 79M08
6. -5 & -8 ASSY OUTPUT IS +12V -10 ASSY OUTPUT IS ± 8V
5. -5 ASSY A3 IS UGA7812393 OR MC7812CP
4. A3 IS UGA7815393 OR MC7815CP
3. A2 IS MC7915CP OR 7915UC
2. A1 IS LM305
1. RESISTORS ARE ¼ W, 5%

NOTES UNLESS OTHERWISE SPECIFIED

12. -H ASSY: CR51 IS VH148; ADD HEAT SINK.
11. -15 ASSY: A2 IS LM7909CT; A3 IS LM7910CT
10. -12 ASSY: A2 IS 7915UC
9. -11 ASSY: A2 IS MC7912CP, A3 IS MC7812CP

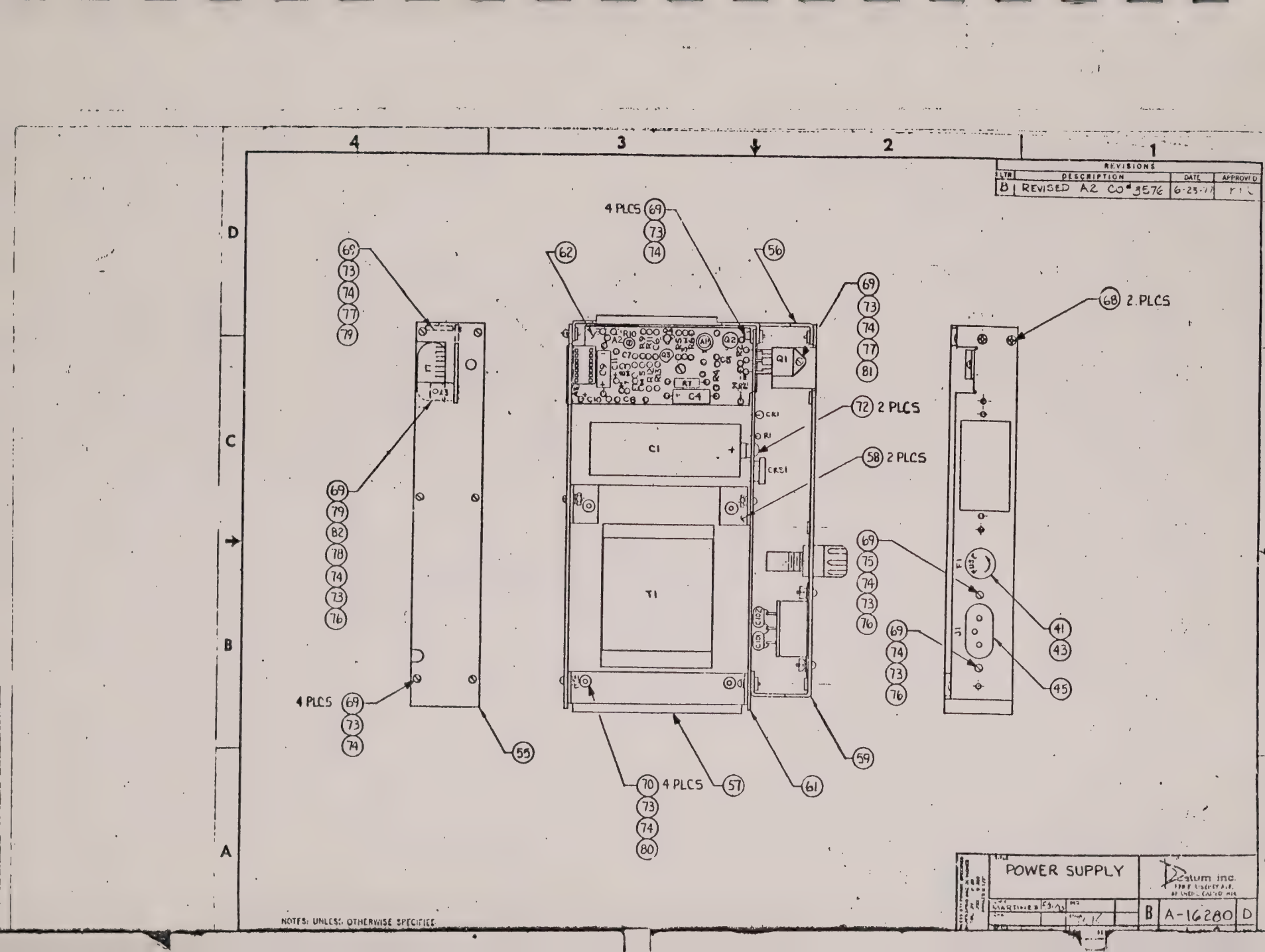
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOL .XX ± .02
.XXX ± .010
ANGLES ± 1/2°

TITLE
REGULATOR
(49)

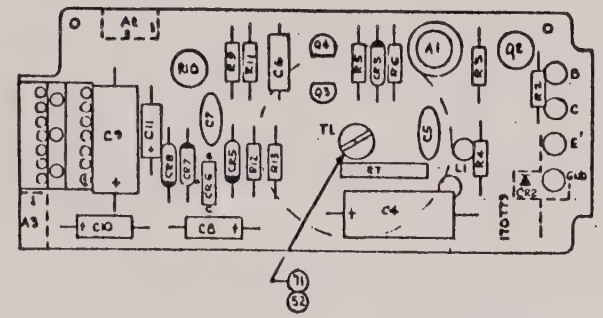
DWN	E.K	3/24/73	DES		3/30
CHK		3/24/73	ENGR		4/73
SCALE	NONE		PRJ	31160	

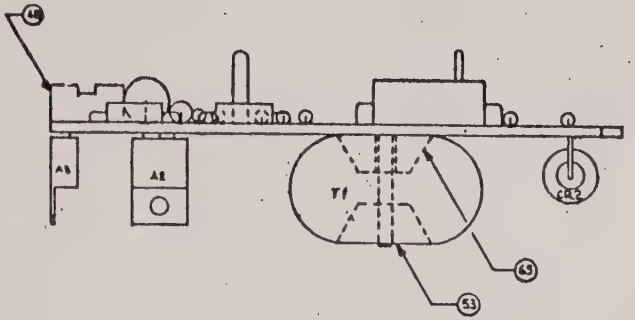
Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

SIZE		DWG NO		REV
B		16280		D
	SHT	2	OF	2


4
3
2
1
D
C
B
A
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
B
REVISED A2 CO #3576
6-23-77
4 PLCS
69
73
74
62
56
68
2 PLCS
72
2 PLCS
58
2 PLCS
77
79
81
82
78
76
75
41
43
45
55
59
61
57
70
80
C1
T1
Q1
C4
POWER SUPPLY
Datum inc.
B
A-16280
D
NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





NOTES: UNLESS OTHERWISE SPECIFIED

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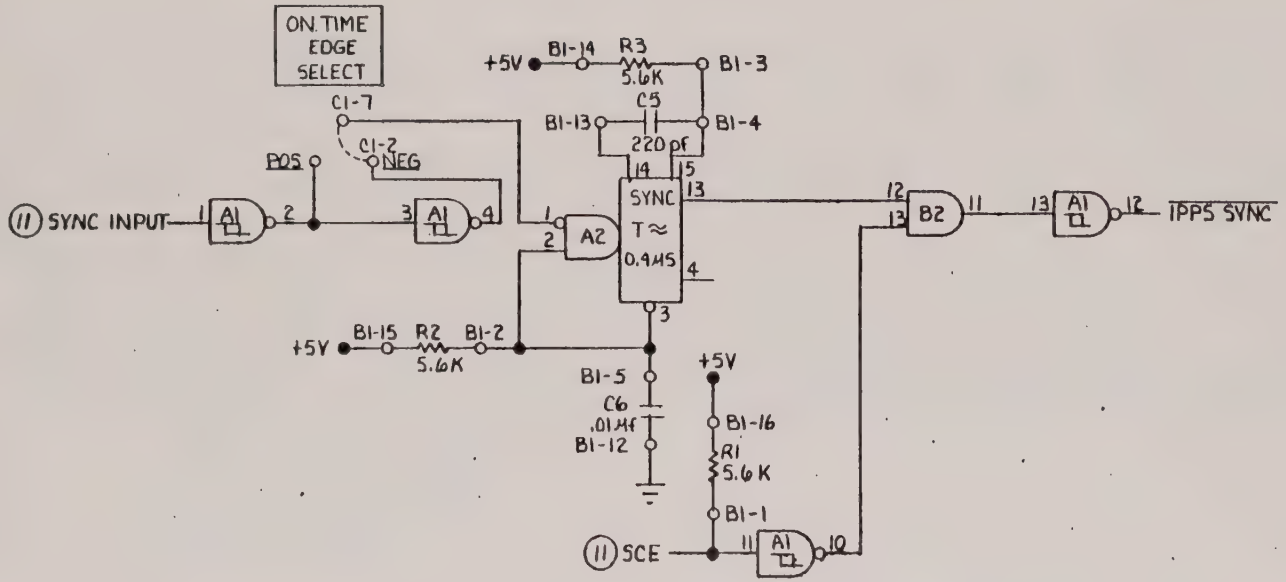
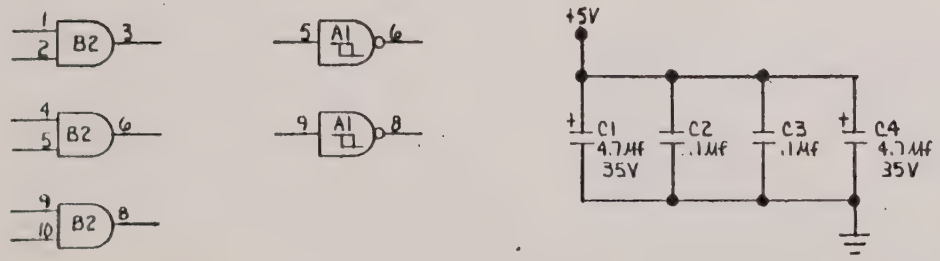
TITLE	ASSEMBLY AID-REGULATOR	Datum Inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM CALIFORNIA 92806	
DWN EM 7/6/73	DES		
CHK	APVD WJR	B	A-16280-3 D
SCALE 2:1	FSCM 81160	SIZE	SHT 2 OF 2 REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED





SN74123N	TI	A2
N7408A	SIGNETICS	B2
SN7414N	TI	A1
PART NO	MFR	REF. DES.

THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL .XXX ±.010 ANGLES ±1/2°

TITLE: IPPS SYNC

(52)

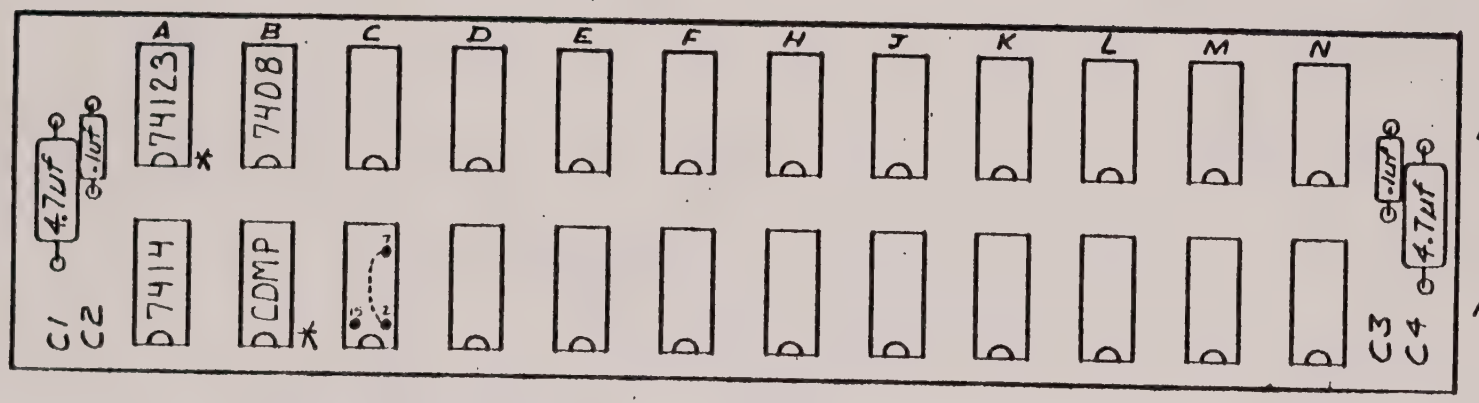
DWN	TERI 12/10/81	DES	
CHK		ENGR	1/6
SCALE	NONE	FSC	31160

Datum Inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

B 18299

SIZE SHT 1 OF 1 REV

NOTES: UNLESS OTHERWISE SPECIFIED



SOLDER LONG WIRE WRAP PINS TO C1-2, 7, + 15.

SOLDER ONE END OF JUMPER TO C1-7.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: XX ± .03, XXX ± .010, ANGLES ± 1/2°	TITLE: IPPS SYNC 18299			datum inc.	
	DWN: DENISE	4/19/85	DES:		
	CHK:		ENGR:		
	SCALE: NONE		FSC: 31160	SIZE: A	A-18299
				SHT 1 OF 1	REV

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

16062
WAS

(11) (8) CMSC/ tMSCB/ CDCCB — A4

(3) 16543
WAS

(5) +5V* — E32
(2) FS — 10
E33
(5) GFS — 13
C4
9 FS*
12 GFS*

(8) 16543
WAS

(5) +5*
(3) FWD
F4

16062
IS

(11) (8) CMSC tMSCB CDCCB
(52) IPPS SYNC — A4

(3) 16543/18256
IS

E32
(2) FS — 10
(52) IPPS SYNC
E33
(5) GFS — 13
C4
9 FS*
12 GFS*

(8) 16543/18256
IS

LOCATED ON 18299
(11) GEN
(3) FWD
B2
F4

NOTES: UNLESS OTHERWISE SPECIFIED

THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: XX ± .010 XXX ± .005 ANGLES ± 1/2°

TITLE: MODIFICATION DRAWING (80) (9300-7368)

datum inc.
1363 S. STATE COLLEGE BLVD.
ANAHEIM, CALIFORNIA 92806

DWN	CHK	DES	ENGR	SCALE	FSC
DENISE 4/12/85			4/14/85	NONE	31160

B 9300-8804
SIZE SHT 1 OF 1 REV

SECTION SEVEN
LIST OF MATERIALS

The following terms are used on the materials lists form. Their specific usage is explanined below to aid in using the included information for replacement part logistics.

a. ITEM - A numeric listing of each part or component comprising each assembly.
b. STOCK/PART Number - Each part or component is identified by its DATUM stock number or original manufacturer's part number. A DATUM stock number is used when the part is maintained in DATUM's stock inventory. The manufacturer's part number is used when the part is not maintained in inventory.
c. DESCRIPTION - Each part or component is identified by its descriptive nomenclature.
d. MFR/SPEC - Each part or component availability source is listed. Those items identified with DATUM stock numbers show "DATUM". Those not in inventory (and listed by original manufacturer's part number) show the original manufacturer.
e. QTY - The quantity of each item utilized in the assembly.
f. REF. DES. - Identification of the part or component as indicated on the support schematic drawing.
g. UNIT COST, LOT TOTAL - For customer use, as desired.

NOTE: The following Material List is intended as only a reference guide, and not as spare parts list to be sold as individual pieces.

1.	Time Code Generator/Translator	9300-7368
2.	Time Code Generator/Translator	9300-001
3.	AGC	16085-1
4.	Failsafe	19168-1
5.	IRIG Basic	18256-136
6.	LED Display	16549-1
7.	Parallel Outputs	16635-123
8.	IRIG B Encoder	16062-1
9.	Power Supply	16280-3
10.	1PPS Sync	18299

MATERIAL LIST

DRAWN: SATINDER

CHK: _____

datum inc.

JOB NO: _____ REV

QUANTITY _____

TITLE: TIME CODE GEN/TRANS

ASS'Y NO: 9300-7368

SHT 1 OF 1

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
1	9300-001	BASIC ASSY STK	DATUM	1			
2	SK 9300-7368	SHIPPING KIT	"	1			
3							
4	1202-0102	SWITCH SPDT	"	1			
5	1704-1002	CONNECTOR BNC	"	1			
6	1795-0001	WASHER	"	1			
7	" -0002	"	"	1			
8							
9	700546	STIFFENER STK	"	4			
10	703335-1	BUTCH PLATE - STK	"	1			
11	705967	SWITCH "	"	1			
12	707349-5	BUTCH " STK	"	1			
13							
14	16635-123	PARALLEL OUTPUTS STK	"	1			
15	18256-136	BASIC	"	1	△1		
16	18299	SYNC IPPS	"	1			
17	19168-1	FAILSAFE AND	"	1			
/		REGENERATE MUX					

NOTES: △1 M/F 16543-16 IN BASIC ASSY

BISHOP GRAPHICS/ACCUPRESS
REORDER NO A10500

DATE: 1-18-78
DRAWN: R. FLOCK
CHK:

MATERIAL LIST

datum inc.

JOB NO:
QUANTITY
D

TITLE: TIME CODE GEN/TRANS BASIC
ASS'Y NO: 9300-001
SHT 1 OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
1	0226-0104-1	CAPACITOR .1uf @100V	DATUM	1	C101		
2							
3	1202-0102	SWITCH SPDT	"	4			
4	1204-3903	" P/B	"	10			
5	1206-5112-N	" ROTARY	"	1			
6	1212-7606-1	" T/W	"	1			
7	1299-7656-1	BAND HDWE	"	1			
8							
9	1704-1002	RECEPT BNC	"	2			
10	" -1625-6R	" 6P	"	1			
11	1792-1855	SKT	"	6			
12	1795-0001	WASHER	"	2			
13	" -0002	"	"	2			
14							
15	2325-2005	FASTENER	"	2			
16	2524-5010	KNOB	"	1			
17							
18	700362	CENTER SUPPORT STK	"	1			
19	700364-2	COVER STK	"	2			
20	700546	STIFFENER STK	"	3			
21	703995	MTG BKT STK	"	2			
22	704757-2	SIDE GUSSET STK	"	2			
23	704899-1	REAR PANEL STK	"	1			
24	707349-1	BUTCH PLATE STK	"	1			
25							
26							

NOTES:

SHOP GRAPHICS/ACCUPRESS
SLR NO. A 7967

DATE: 1-18-78

DRAWN: R. FLOCK

CHK:

MATERIAL LIST

datum inc.

JOB NO:

QUANTITY

REV: D

TITLE: TIME CODE GEN/TRANS BASIC

ASS'Y NO: 9300-001

SHT 2 OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
27	705850	FRONT PANEL STK	DATUM	1			
28	705853	COVER PLATE STK	"	1			
29	705866-3	LENS STK	"	1			
30							
31	931500	HANDLE STK	"	2			
32							
33	170979 A	P.C. BD. STK	"	1			
34							
35	16062-1	IRIG ENCODER STK	"	1			
36	16085	AGC STK	"	1			
37	16280-3	POWER SUPPLY STK	"	1			
38	16543-16	BASIC STK	"	1			
39	16549-1	DISPLAY STK	"	1			

NOTES:

GRAPHICS/ACCUPRESS
NQ A-7967

DATE: 3-6-75

DRAWN: RHE

CHK:

MATERIAL LIST

datum inc.

JOB NO:

QUANTITY

REV H

TITLE: AGC

ASS'Y NO: 16085-1

SHT 1 OF 3

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
1	0102-0330	RESISTOR 33Ω 1/4W 5%	DATUM	1	R10		
2	" -0910	" 91Ω " "	"	1	R3		
3	" -0391	" 390Ω " "	"	1	R44		
4	" -0511	" 510Ω " "	"	1	R18		
5	" -0561	" 560Ω " "	"	1	R17		
6	" -0102	" 1K " "	"	7	R21,22,26,33,38,43,45		
7	" -0122	" 1.2K " "	"	1	R37		
8	" -0152	" 1.5K " "	"	1	R30		
9	" -0202	" 2K " "	"	1	R46		
10	" -0272	" 2.7K " "	"	3	R25,32,39		
11	" -0302	" 3K " "	"	1	R31		
12	" -0512	" 5.1K " "	"	8	R4,8,12-14,20,34,40		
13	" -0682	" 6.8K " "	"	1	R29		
14	" -0752	" 7.5K " "	"	1	R16		
15	" -0103	" 10K " "	"	7	R5-7,11,28,36,41		
16	" -0183	" 18K " "	"	1	R24		
17	" -0473	" 47K " "	"	1	R23		
18	" -0753	" 75K " "	"	1	R19		
19	" -0124	" 120K " "	"	4	R2,9,15,35		
20	" -0274	" 270K " "	"	1	R47		
21	" -0105	" 1MEG " "	"	3	R1,27,42		
22	0104-0221	" 220Ω 1/2W "	"	1	R48		
23							
24	0220-0474	CAPACITOR .47μf @ 35V	"	2	C4,8		
25	" -0105	" 1μf "	"	6	C2,15,16,19-21		
26	" -0475	" 4.7μf "	"	5	C3,12,13,17,18		

NOTES:

BISHOP GRAPHICS/ACCUPRESS
REORDER NO. A1000

DATE: 3-6-75

DRAWN: RGE

CHK:

MATERIAL LIST

datum inc.

JOB NO:

QUANTITY

H

TITLE: AGC

ASS'Y NO: 16085-1

SHT 2 OF 3

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
27	0220-0107	CAPACITOR 100uf @10V	DATUM	1	C14		
28	0221-0221	" 220uf @ 4V	"	2	C11A, 11B		
29	0225-0471	" 470pf @ 100V	"	1	C22		
30	" -0152	" 1500pf "	"	1	C10		
31	0226-0100	" 10pf "	"	1	C6		
32	" -0470	" 47pf "	"	1	C9		
33	" -0102	" .001uf "	"	1	C7		
34	" -0203	" .02uf "	"	1	C5		
35	" -0104-1	" .1uf "	"	1	C1		
36							
37	0301-7405	I.C. N7405A	"	1	A5		
38	" -7749	" uA7749393	"	2	A1,4		
39	" -9311-H	" LM311H	"	2	A2,3		
40							
41	0500-0306	DIODE 1N914A	"	2	CR1,3		
42	0515-0705-1	ZENER 4.8V 1N705A	"	1	CR2		
43	" -0752-1	" 5.6V 1N752A	"	1	CR4		
44							
45	0550-7705	TRANSISTOR 2N3565	"	1	Q6		
46	0555-6600	" 2N3645	"	1	Q7		
47	0570-1087	" P1087E	"	3	Q3-5		
48	" -8703	" U1487E	"	1	Q2		
49	" -8704	" 988704	"	1	Q1		
50							
51							
52							

FC

PRESS

DATE: 3-6-75

DRAWN: RGE

CHK:

MATERIAL LIST

Datum inc.

JOB NO:

QUANTITY

REV H

TITLE: AGC

ASS'Y NO: 16085-1

SHT 3 OF 3

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
53	1708-3100-1	SKT 14P	DATUM	3			
54	" -8000	" 8P	"	2			
55							
56	170574 E1	P.C. BD STK	"	1			
57	170785 N/C	" " STK	"	1			

NOTES:

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A1806

DATE: 3-11-85

DRAWN: SATINDER

CHK: _____

MATERIAL LIST

datum inc.

JOB NO: _____

QUANTITY _____

TITLE: FAILSAFE & REGENERATE MUX

ASS'Y NO: 19168 -1

SHT 1 OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.					REF. DES.	UNIT COST	LOT TOTAL	
1	0102-0391	RESISTOR 390 Ω, 1/4W, 5%	DATUM	2					R13, 15			
2	" -0102	" 1K " "	"	3					R5, 7, 10			
3	" -0562	" 5.6K " "	"	4					R1, 3, 11, 12			
4	" -0512	" 5.1K " "	"	1					R14			
5	" -0103	" 10K " "	"	2					R4, 6			
6	" -0223	" 22K " "	"	1					R2			
7	" -0752	" 10K " "	"	1					R9			
8	0150-1002-1	" POT 10K	"	1					R8			
9	0212-0103	CAPACITOR .01Mf, 100V	"	2					C5, 6			
10	0220-0474	" .47Mf, 35V	"	1					C8			
11	" -0335	" 3.3Mf "	"	1					C7			
12	" -0475	" 4.7Mf "	"	2					C1, 4			
13	0225-0101	" 100pf	"	1					C9			
14	0226-0104	" .1Mf, 10V	"	2					C2, 3			
15												
16	0302-LS12-3	I.C. 74LS123	"	2				*	C1, F2			
17	" -LS00	" 74LS00	"	2					J1, A2			
18	" -LS08	" 74LS08	"	3					F1, J2, L2			
19	" -LS32	" 74LS32	"	2					K1, K2			
20	" -LS74	" 74LS74	"	1					H1			
21	" -LS21	" 74LS21	"	1					E2			
22	" -LS15-7	" 74LS157	"	1				*	L1			
23	0301-9311	" LM311D	"	1					B1			
24												
25	0801-1169	P.C. BOARD (1 SECTION)	"	1								
26												

NOTES: WIRELIST NO. B09712

BISHOP GRAPHICS/ACCUPRESS
REORDER NO. A19500

DATE: 3-11-85

DRAWN: SATINDER

CHK:

MATERIAL LIST

datum inc.

JOB NO:

QUANTITY

REV

TITLE: FAILSAFE & REGENERATE MUX

ASS'Y NO: 19168-1

SHT 2 OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.				REF. DES.	UNIT COST	LOT TOTAL	
27	1708-0016	COMP BD	DATUM	2			*	C2, H2			
28	" - 3897	SOCKET 14P W/W	"	10							
29	" - 3898	" 16P "	"	5			*				

NOTES:

BRADLEY GRAPHICS/ACCUPRESS
REORDER NO. A1000

DATE: 8-12-81
DRAWN: CARY
CHK:

MATERIAL LIST

datum inc.

JOB NO:
QUANTITY
TITLE: IRIG BASIC
ASS'Y NO: 18256-136

REV
SHT 1 OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.				REF. DES.	UNIT COST	LOT TOTAL	
1	0102-0151	RESISTOR, 150Ω, ¼W, 5%	DATUM	1				R3			
2	" -0102	" 1K " "	"	1				R4			
3	" -0512	" 5.1K " "	"	1				R1			
4	" -0562	" 5.6K " "	"	3				R9, 10, 11			
5	" -0103	" 10K " "	"	1				R2			
6	0126-R6K0	RES CHIP 6K	"	2				C6, C8			
7											
8	0220-0475	CAPACITOR 4.7uf @ 35V	"	7				C3, 14-17, 22, 23			
9	0221-0685	" 6.8uf "	"	1				C26			
10	0225-0330	" 33 pf @ 100V	"	3				C10, 11, 12			
11	" -0221	" 220 pf "	"	2				C1, 2			
12	" -0331	" 330 pf "	"	2				C9, 13			
13	0226-0104	" .1uf @ 10V	"	5				C18-21, 24			
14											
15	0301-7H03	I.C. SN74H103N	"	1				F10			
16	" -7H06	" SN74H106N	"	1			*	D4			
17	" -7122	" SN74122N	"	1				C11			
18	" -7123	" SN74123N	"	2			*	B11, D5			
19	" -LS15-6	" SN74LS156N	"	2			*	C5, C7			
20	" -7157	" SN74157N	"	3			*	C4, D7, E7			
21	" -7192	" SN74192N	"	10			*	B2-B10, E4			
22	" -7194	" SN74194N	"	1			*	C2			
23	" -7400	" N7400A	"	3				A11, D2, D10			
24	" -7404	" N7404A	"	1				D3			
25	" -7408	" N7408A	"	3				D9, F8, F9			

NOTES: CUT ETCH: E1 TO E3 (BOTTOM); C4-9 (BOTTOM) ADD JUMPER: E1 TO E2

BISHOP GRAPHICS/ACCUPRESS
FLOWER MD A 7967

DATE: 8-12-81
DRAWN: CARY
CHK:

MATERIAL LIST

Datum inc.

JOB NO:
QUANTITY
REV

TITLE: IRIG BASIC

ASS'Y NO: 18256-136

SHT 2 OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.				REF. DES.	UNIT COST	LOT TOTAL	
27	0301-7410	I.C. N7410A	DATUM	1				D11			
28	" -7411	" N7411A	"	1				C9			
29	" -7425	" SN7425N	"	1				E8			
30	" -7432	" SN7432N	"	1				D6			
31	" -7442	" N7442B	"	1			*	E6			
32	" -7473	" SN7473N	"	1				E10			
33	" -7474	" SN7474N	"	2				E9, F11			
34	" -7486	" N7486A	"	2				C3, D8			
35	" -8280	" N8280A	"	5				E5, F4-F7			
36	" -8281	" N8281A	"	2				C10, E11			
37	" -9374	" 9374DC	"	9			*	A2-A10			
38											
39	1301-0001	OSCILLATOR	"	1				Y1			
40											
41	1708-3897	SKT 14P W/W	"	27							
42	" -3898	" 16P "	"	29			*				
43											
44	2310-1591-B	MTG BLOCK	"	2							
45											
46	170969 E	P.C. BD. STK	"	1							

NOTES:

BISHOP GRAPHICS/ACCUPRESS
REORDER NO. A 7967

DATE: 1-26-76

DRAWN: R. FLOCK

CHK:

MATERIAL LIST

Datum Inc.

JOB NO:

QUANTITY

TITLE: LED DISPLAY

ASS'Y NO: 16549-1

SHT 1 OF 1

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
1	1708-0036	HEADER	DATUM	2			
3	" -3788-1	SOCKET 14 P	"	9			
5	2205-0006	LED DISPLAY		9	DS1-9		
7	170937 B	P.C. BD. STK	"	1			
8							
9	A-16549	ASSY AID	"	REF			

NOTES:

BISHOP GRAPHICS/ACCUPRESS
REORDER NO A-7967

DATE: 3-5-74
DRAWN: RAE
CHK:

MATERIAL LIST

datum inc.

JOB NO:
QUANTITY
A

TITLE: PARALLEL OUTPUT

ASS'Y NO: 16635-123

SHT 1 OF 1

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.				REF. DES.	UNIT COST	LOT TOTAL	
1	0102-0222	RESISTOR 2.2K, ¼W, 5%	DATUM	1				R1			
2	0102-0103	RESISTOR 10K, ¼W, 5%	"	1				R2			
3											
4	0220-0475	CAPACITOR 4.7μf, 35V	"	2				C1, C3			
5	0225-0471	" 470 Pf	"	1				C5			
6	0226-0103-1	" .01 μf, 100V	"	1				C6			
7	0226-0104	" .1 μf, 10V	"	2				C2, C4			
8											
9	0301-7123	IC SN74123N	"	1			*	A1			
10	0301-7408	IC N7408A	"	12				A2-7, 14-19			
11											
12	1704-0050	CONNECTOR 50P	"	1				J4			
13											
14											
15	1708-3897	SOCKET 14P W/W	"	12							
16	1708-3898	SOCKET 16P W/W	"	1			*				
17											
18	703336	CONN PLATE STK	"	1							
19											
20	171112 N/C	PC BOARD STK	"	1							

NOTES:

BISHOP GRAPHICS/ACCUPRESS
REORDER NO. A1808

DATE: 10-20-75
DRAWN: RJE
CHK:

MATERIAL LIST

Datum inc.

JOB NO:
QUANTITY
C

TITLE: IRIG ENCODER

ASS'Y NO: 16062-1

SHT 1 OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.				REF. DES.	UNIT COST	LOT TOTAL	
1	0102-0100	RESISTOR 10Ω ¼W 5%	DATUM	2				R 26, 27			
2	" -0510	" 51Ω " "	"	1				R 25			
3	" -0222	" 2.2K " "	"	2				R1, 13			
4											
5	" -0332	" 3.3K " "	"	1				R3			
6	" -0472	" 4.7K " "	"	1				R 12			
7	" -0103	" 10 K " "	"	5				R2, 11, 16, 18, 19			
8	" -0473	" 47 K " "	"	3				R6, 10, 14			
9	" -0104	" 100 K " "	"	1				R 20			
10	0115-5111	" 5.11 K " 1%	"	1				R 8			
11	" -2262	" 22.6 K " "	"	3				R 4, 5, 9			
12	0154-5001	RESISTOR POT 5K	"	2				R 15, 17			
13	" -2002	" " 20K	"	1				R 7			
14	0201-0221	CAPACITOR 220 Pf	"	1				C 10			
15	0212-0222	" .0022Mf 100V	"	2				C6, 8			
16	" -0223	" .022 Mf 100V	"	2				C 7, 9			
17	0220-0475	" 4.7 Mf 35V	"	3				C1, 3, 5			
18											
19	0226-0104	" .1 Mf 10V	"	2				C2, 4			
20	" -0107-1	" .1 Mf 100V	"	2				C 11, 12			
21											
22	0301-5558	IC LM 145 B N	"	2				A 17, 18			
23	0302-LS 10-7	" SN 74 LS 107 N	"	1				A 7			
24	0301-7151	" SN 74 151 N	"	6			*	A 10, 15			
25	" -7400	" N 7400 A	"	2				A 2, 3			
26	" -7408	" N 7408 A	"	3				A 1, 4, 16			

NOTES:

HEADING GRAPHICS/ACCUPRESS
HEADER NO. A1900

DATE: 10-20-75
DRAWN: RHE
CHK:

MATERIAL LIST

Datum Inc.

JOB NO:
QUANTITY:

C

TITLE: IRIG ENCODER

ASS'Y NO: 16062-1

SHT 2 OF 2

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.				REF. DES.	UNIT COST	LOT TOTAL
27	0301-7411	IC N7411A	DATUM	1				A5		
28	" -7432	" SN7432N	"	2				A6, 8		
29										
30										
31										
32										
33										
34	0570-1087	TRANSISTOR P1087E	"	1				Q1		
35										
36	1706-2010	TERMINAL	"	4				TP1-4		
37	1708-2034	SOCKET 8P	"	2						
38	" -3897	" 14P W/W	"	9						
39	" -3898	" 16P "	"	6			*			
40										
41	170518 A	PC BOARD STK	"	1						

NOTES:

DATE: 11-14-74
DRAWN: [illegible]
CHK:

MATERIAL LIST

datum inc.

JOB NO:
QUANTITY
D

TITLE: POWER SUPPLY

ASS'Y NO: 16280-3

SHT 1 OF 3

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY	REF. DES.	UNIT COST	LOT TOTAL
1	0102-0220	RESISTOR 22Ω 1/4W 5%	DATUM	1	R4		
2	" -0680	" 68Ω " "	"	2	R2,12		
3	" -0101	" 100Ω " "	"	1	R13		
4	" -0332	" 3.3K " "	"	1	R11		
5	" -0472	" 4.7K " "	"	1	R1		
6	" -0682	" 6.8K " "	"	1	R9		
7	" -0473	" 47K " "	"	2	R5,6		
8	" -0754	" 750K " "	"	1	R3		
9							
10	0125-0R10	" .1Ω 3W	"	1	R7		
11	0154-1001	" POT 1K	"	1	R10		
12							
13	0212-0223	CAPACITOR .022μf 100V	"	1	C6		
14	0219-0588	" 5800μf 40V	"	1	C1		
15	0220-0475	" 4.7μf 35V	"	2	C 10,11		
16	" -0476	" 47μf "	"	2	C4,9		
17	" -0106-1	10μf "	"	1	C8		
18	0226-0103	" .01μf 1000V	"	2	C.101,102		
19	" -0104	" .1μf 10V	"	2	C5,7		
20							
21	0301-7815	EC 7815UC	"	1	A3		
22	" -7915	" 7915UC	"	1	A2		
23	" -9305	" LM305H	"	1	A1		
24							
25	0500-0306	DIODE IN914A	"	1	CR3		
26	0515-0752-1	" IN752A	"	1	CR5		

NOTES:

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DATE: 11-14-74
DRAWN: RHE
CHK:

MATERIAL LIST

datum inc.

JOB NO:
QUANTITY
D

TITLE: POWER SUPPLY

ASS'Y NO: 16280-3

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	EXT TOTAL
27	0540-0106-1	DIODE MCR106-1	DATUM	1	CR6		
28	" -0447	" VS447	"	1	CR51		
29	" -0820	" MR820	"	1	CR2		
30	" -4720-1	" MR501	"	1	CR1		
31	" -4934	" 1N4934	"	2	CR7,8		
32							
33	0550-035A	TRANSISTOR TIP-35A	"	1	Q1		
34	" -7705	" 2N3565	"	1	Q4		
35	0555-6005	" 2N2905A	"	1	Q2		
36	" -6600	" 2N3645	"	1	Q3		
37							
38	0601-6045	CHOKE	"	1	L1		
39	" -6082	TRANSFORMER	"	1	T1		
40							
41	0702-0010	FUSE 1A 5/8 3AG	"	1	F1		
42							
43	0750-0200	" HOLDER	"	1	XF1		
44							
45	1704-1061-1	CONNECTOR AC	"	1			
46							
47	1706-0033	EYELET	"	2	(L1)		
48	1708-3897	SOCKET 14P W/W	"	1			
49	" -8000	" 8P	"	1	XA1		
50							
51							
52	2310-1247-09	STANDOFF #6 x 1/8	"	1	(L1)		

NOTES:

GN MINOR GRAPHICS/ACCUPRESS

DATE: 11-14-74
DRAWN: RHL
CHK:

MATERIAL LIST

datum inc.

JOB NO:
QUANTITY
D

TITLE: POWER SUPPLY
ASS'Y NO: 16280-3
SHT 3 OF 3

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.	REF. DES.	UNIT COST	LOT TOTAL
53	2325-1004	TOROID RETAINER	DATUM	1	(41)		
54							
55	704561	MTG PLATE STK	"	1			
56	704562	SIDE BRKT STK	"	1			
57	704966-1	MTG " STK	"	1			
58	704966-2	" " STK	"	2			
59	707350	HEATSINK STK	"	1			
60							
61	170778 E	P.C. BOARD STK	"	1			
62	170779 C	" " STK	"	1			
63							
64							
65	120-4	TOROID RETAINER	DELBERT BLINN	1	(41) M/S		

NOTES:

DATE: 11-19-81
DRAWN: LNA
CHK:

MATERIAL LIST

datum inc.

JOB NO:
QUANTITY

TITLE: 1PPS SYNC

ASS'Y NO: 18299

SHT 1 OF 1

ITEM	STOCK/PART NO.	DESCRIPTION	MFR/SPEC	QTY.					REF. DES.	UNIT COST	LOT TOTAL	
1	0102-0562	RESISTOR 5.6K, 1/4W, 5%	DATUM	3					R1-3			
2												
3	0226-0104	CAPACITOR .1μf, 10V	"	2					C2,3			
4	0225-0221	" 220pf, 100V	"	1					C5			
5	0220-0475	" 4.7μf, 35V	"	2					C1,4			
6	0226-0103-3	" .01μf	"	1					C6			
7	0301-7123	I.C. SN74123N	"	1				*	A2			
8	" -7408	" N7408A	"	1					B2			
9	" -7414	" SN7414N	"	1					A1			
10												
11	1708-0016	SOCKET COMP	"	1				*	B1			
12	" -3897	" 14P W/W	"	2								
13	" -3898	" 16P W/W	"	2				*				
14												
15	0801-1169	PC BOARD (1 SECTION)	"	1								

NOTES: WIRE LIST 808540

BISHOP GRAPHICS/ACCUPRESS

APPENDIX A

TIME CODE FORMATS

The time code formatting data in this Appendix is included for reference purposes only. The actual code either generated or translate by the Model 9300 TCG/T may vary substantially from the formats shown herein, depending on customer specifications.

The Manual Addendum, located immediately behind the title page and entitled "EQUIPMENT CONFIGURATION" defines any deviations from standard formats.

GLOSSARY OF TERMS

ACCURACY (CODE) The correctness of CODE DIGIT WEIGHTING

BINARY NUMBER SYSTEM A number system which uses two symbols, usually denoted by "0" and "1", and has two as its base. Not to be confused with CODE DIGIT WEIGHTING

CODE DIGIT One of a definite set of ELEMENTS, the set comprising a CODE WORD. Each code digit is individually and numerically weighted

CODE DIGIT WEIGHTING The numerical value assigned to a particular CODE DIGIT position

CODE WORD (TIME) A definite set of ELEMENTS which collectively convey information defining an instant of time

ELEMENT One of the parts of which any time signal is composed

FORMAT The arrangement of ELEMENTS within a group

INDEX COUNT The number which identifies a specific ELEMENT position with respect to a REFERENCE MARKER

INSTRUMENTATION TIMING A parameter serving as the fundamental independent variable in terms of which data may be correlated

INDEX MARKERS Uncoded periodic interpolating ELEMENTS

ON TIME The state of any ELEMENT being coincident with the STANDARD REFERENCE TIME

POSITION IDENTIFIER An ELEMENT denoting the position of a portion or all of a CODE WORD

PULSE A variation of a quantity whose value is normally constant; the variation is characterized by a "rise" and a "decay" and has a finite "duration"

REFERENCE MARKER A periodic combination of ELEMENTS which establishes that instant of time defined by the CODE WORD

SECOND The basic unit of TIME

TIME INTERVAL Time interval indicates the duration of a segment of time without reference to when the time interval begins and ends

STANDARD REFERENCE TIME The basic repetition rate chosen as the common time reference for all other INSTRUMENTATION TIMING. (usually 1 pps)

TIME Time signifies epoch; that is, the designation of an instant on a selected time scale and is used in the sense of TIME of day

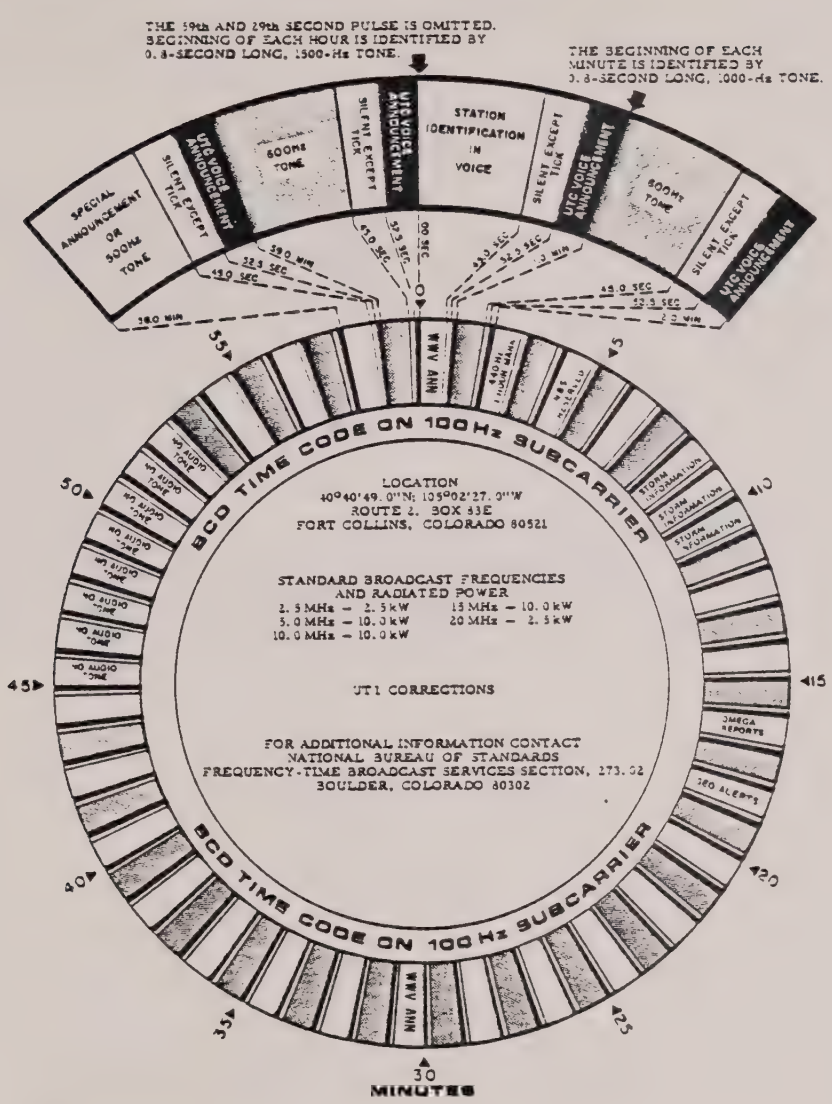
TIME CODE ZERO (Tco) The instant of time defined by all CODE WORDS as zero. It is derived from and coincident with an ELEMENT of the STANDARD REFERENCE TIME

TIME FRAME The TIME INTERVAL between consecutive REFERENCE MARKERS containing all ELEMENTS of a time FORMAT.

ABBREVIATIONS

PDM	PULSE DURATION MODULATION
PWM	PULSE WIDTH MODULATION
TCW	TIME CODE WORD
TOD	TIME OF DAY
Hz	An abbreviation for HERTZ. The derived unit of frequency (cycles per second).
kHz	KILOHERTZ (1000 HERTZ)
ppm	PULSES PER MINUTE
pps	PULSES PER SECOND
ms	MILLISECOND (0.001 second)
μs	MICROSECOND (0.000001 second)
fph	FRAMES PER HOUR
fpm	FRAMES PER MINUTE
fps	FRAMES PER SECOND
UTC	UNIVERSAL TIME COORDINATED. (The U.S. Naval Observatory is responsible for maintaining the reference for time and time interval for the Department of Defense per DOD Directive 5160.51, 1 Feb. 1965.)
BCD	BINARY CODED DECIMAL
CF	CONTROL FUNCTION
SBS	STRAIGHT BINARY SECONDS
STOD	SECONDS TIME OF DAY
BIT	BINARY DIGIT
LSB	LEAST SIGNIFICANT BIT
MSB	MOST SIGNIFICANT BIT
PAM	PULSE AMPLITUDE MODULATION
PWC	PULSE WIDTH CODED

WWV BROADCAST FORMAT (TYPICAL)


THE 59th AND 29th SECOND PULSE IS OMITTED.
BEGINNING OF EACH HOUR IS IDENTIFIED BY
0.8-SECOND LONG, 1500-Hz TONE.
THE BEGINNING OF EACH
MINUTE IS IDENTIFIED BY
0.8-SECOND LONG, 1000-Hz TONE.
SPECIAL ANNOUNCEMENT OR 500Hz TONE
SILENT EXCEPT TICK
UTC VOICE ANNOUNCEMENT
500Hz TONE
SILENT EXCEPT TICK
STATION IDENTIFICATION IN VOICE
SILENT EXCEPT TICK
UTC VOICE ANNOUNCEMENT
500Hz TONE
SILENT EXCEPT TICK
UTC VOICE ANNOUNCEMENT
29.0 SEC
29.3 SEC
00 SEC
29.3 SEC
29.0 SEC
29.3 SEC
29.0 SEC
29.3 SEC
29.0

INTER-RANGE INSTRUMENTATION GROUP
STANDARD INSTRUMENTATION TIMING FORMATS

General

In the early 1950s it became apparent that efficient interchange of test data between the various test ranges and contractor, university and Government laboratories would require time code standardization. This task of standardization was assigned to the Tele-Communications Working Group (TCWG) of the IRIG in October of 1956. The original IRIG standards were accepted by the Steering Committee in 1960. IRIG publication No. 104-60 defined the original IRIG Formats. This document was later revised and then reprinted in August, 1970 as Document No. 104-70. More information regarding the efforts of IRIG and the availability of IRIG standards can be gained by contacting the Secretariat, Range Commander's Council, White Sands Missile Range, New Mexico 88002. More detail concerning the individual range synchronization and instrumentation timing can be obtained by referring to IRIG Document 103-59, "Instrumentation Timing Systems" brochure.

Description of Formats

In the IRIG family, individual Time Code Formats are alphabetically designated 'A', 'B', 'D', 'E', 'G' and 'H'. These are defined in IRIG Document No. 104-70. IRIG 'C', originally defined in IRIG Document No. 104-60, has been eliminated and effectively replaced by IRIG 'H'. Various signal forms are described in the IRIG Document. Identification numbers have been developed in accordance with the following procedure.

Rate Designation:
- A) 1000 pps
- B) 100 pps
- D) 1 ppm
- E) 10 pps
- G) 10000 pps
- H) 1 pps

Form Designation:
- 0) Pulse, width-coded
- 1) Sine wave, amplitude-modulated

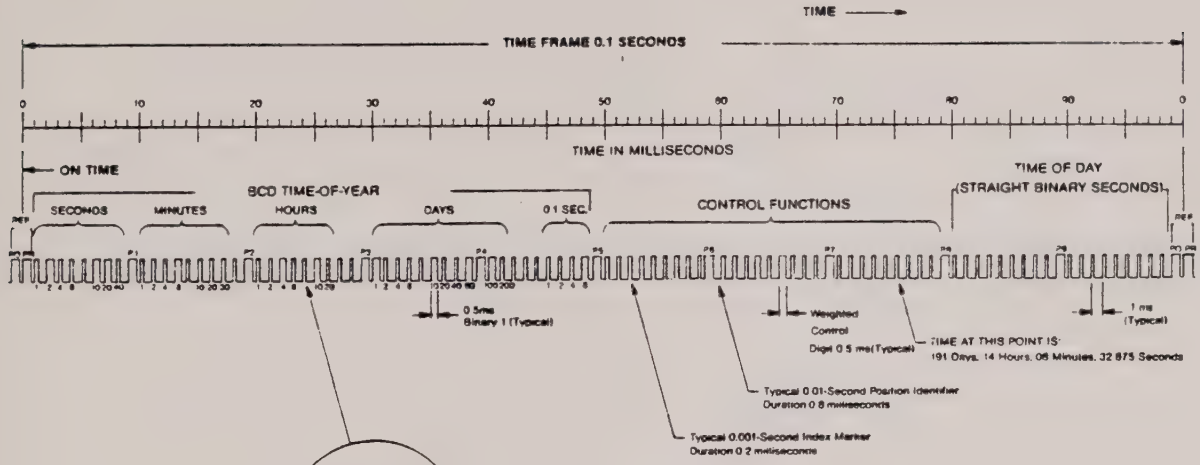
Carrier/Resolution:
- 0) No carrier/index count interval
- 1) 100 Hz/10 ms
- 2) 1000 Hz/1 ms
- 3) 10000 Hz/0.1 ms
- 4) 100000 Hz/0.01 ms

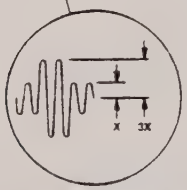
Coded Expressions:
- 0) BCD, CF, SBS
- 1) BCD, CF
- 2) BCD
- 3) BCD, SBS

Only the following signals are recognized to be standard forms in accordance with the IRIG standard:

Format A	Format B	Format D	Format E	Format G	Format H
A000	B000	D001	E001	G001	H001
A003	B003	D002	E002	G002	H002
A130	B120	D111	E111	G141	H111
A133	B123	D112	E112	G142	H112
		D121	E121		H121
		D122	E122		H122

IRIG FORMAT 'A'—GENERAL



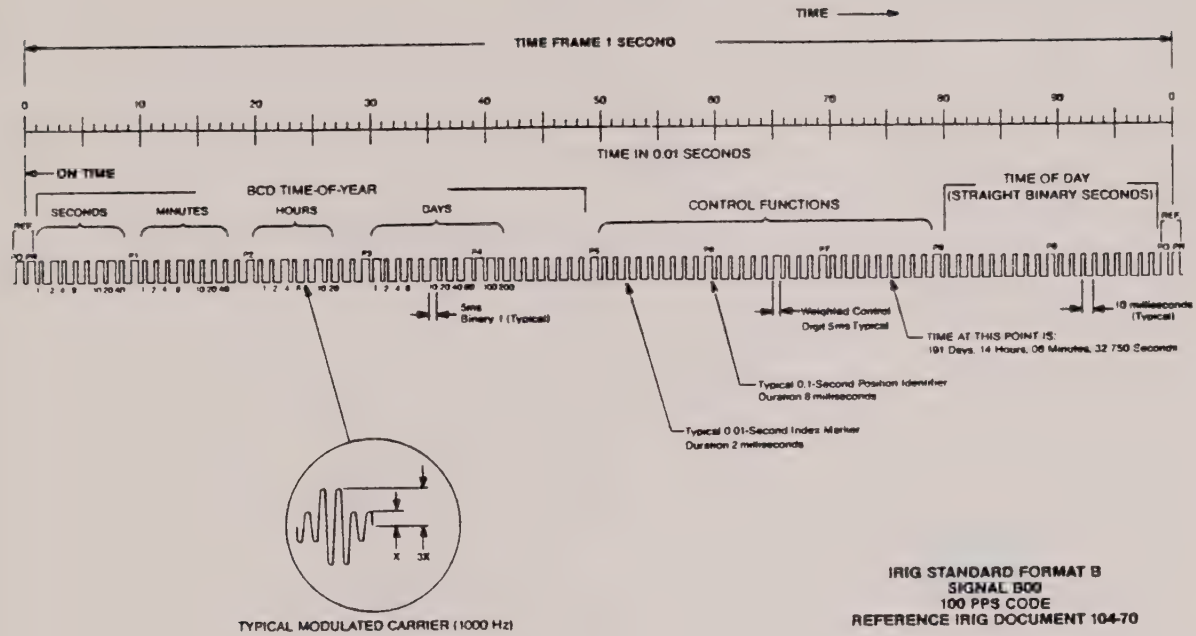


TYPICAL MODULATED CARRIER (10000 Hz)

IRIG STANDARD FORMAT A
SIGNAL A00
1000 PPS CODE
REFERENCE IRIG DOCUMENT 104-70

1. **TIME FRAME:** 0.1 second
2. **CODE DIGIT WEIGHTING OPTIONS:** BCD, SB or both:
   a. Binary Coded Decimal Time-of-Year CODE WORD — 34 binary digits.
      (1) Seconds, minutes, hours, days and 0.1 seconds. Recycles yearly.
   b. Straight Binary Time-of-Day CODE WORD — 17 binary digits.
      (1) Seconds only. Recycles each 24 hours. (86399)
3. **CODE WORD STRUCTURE:**
   a. **BCD.** Word begins at INDEX COUNT 1. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS (seven for seconds; seven for minutes; six for hours; ten for days; four for 0.1 seconds) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
   b. **SB.** Word begins at INDEX COUNT 80. Seventeen binary-coded elements occur, with a POSITION IDENTIFIER between the 9th and 10th binary-coded elements.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first, except for fractional seconds information, which occurs following the day-of-year information.
5. **ELEMENT RATES AVAILABLE:**
   a. 1000 per second (basic Element rate)
   b. 100 per second (POSITION IDENTIFIER rate)
   c. 10 per second (Frame rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each Element is its leading edge.
   b. INDEX MARKER duration: 0.2 milliseconds (Binary Zero or uncoded Element)
   c. CODE DIGIT duration: 0.5 milliseconds (Binary one)
   d. POSITION IDENTIFIER: 0.8 milliseconds
   e. REFERENCE MARKER: Two consecutive POSITION IDENTIFIERS.
   (The "on-time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 1 millisecond (unmodulated); 0.1 millisecond (modulated).
8. **CARRIER FREQUENCY:** 10 kHz when modulated.

IRIG FORMAT 'B' — GENERAL

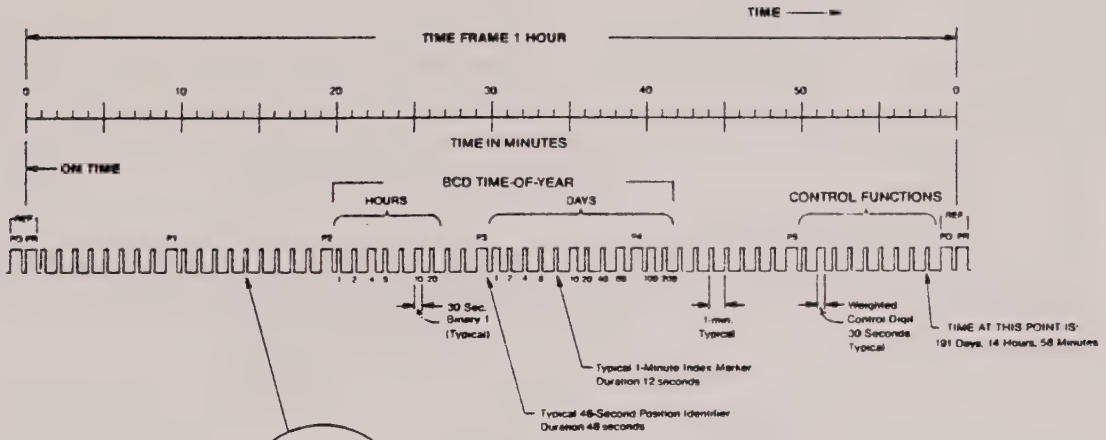


TYPICAL MODULATED CARRIER (1000 Hz)

IRIG STANDARD FORMAT B
SIGNAL B00
100 PPS CODE
REFERENCE IRIG DOCUMENT 104-70

1. **TIME FRAME:** 1.0 second.
2. **CODE DIGIT WEIGHTING OPTIONS:** BCD, SB or both:
   a. Binary Coded Decimal Time-of-Year CODE WORD — 30 binary digits.
      (1) Seconds, minutes, hours and days. Recycles yearly.
   b. Straight Binary Time-of-Day CODE WORD — 17 binary digits.
      (1) Seconds only. Recycles each 24 hours. (86399)
3. **CODE WORD STRUCTURE:**
   a. **BCD:** Word begins at INDEX COUNT 1. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS (seven for seconds, seven for minutes; six for hours; ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
   b. **SB:** Word begins at INDEX COUNT 80. Seventeen binary-coded elements occur with a POSITION IDENTIFIER between the 9th and 10th binary-coded elements.
4. **LEAST SIGNIFICANT DIGIT:** occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 100 per second (basic Element rate)
   b. 10 per second (POSITIVE IDENTIFIER Rate)
   c. 1 per second (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each Element is its leading edge.
   b. INDEX MARKER duration: 2 milliseconds (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 5 milliseconds (Binary one)
   d. POSITION IDENTIFIER duration: 8 milliseconds
   e. REFERENCE MARKER — one per second: Two consecutive POSITION IDENTIFIERS.
      (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 10 milliseconds (unmodulated); 1 millisecond (modulated).
8. **CARRIER FREQUENCY:** 1 kHz when modulated.

IRIG FORMAT 'D' – GENERAL

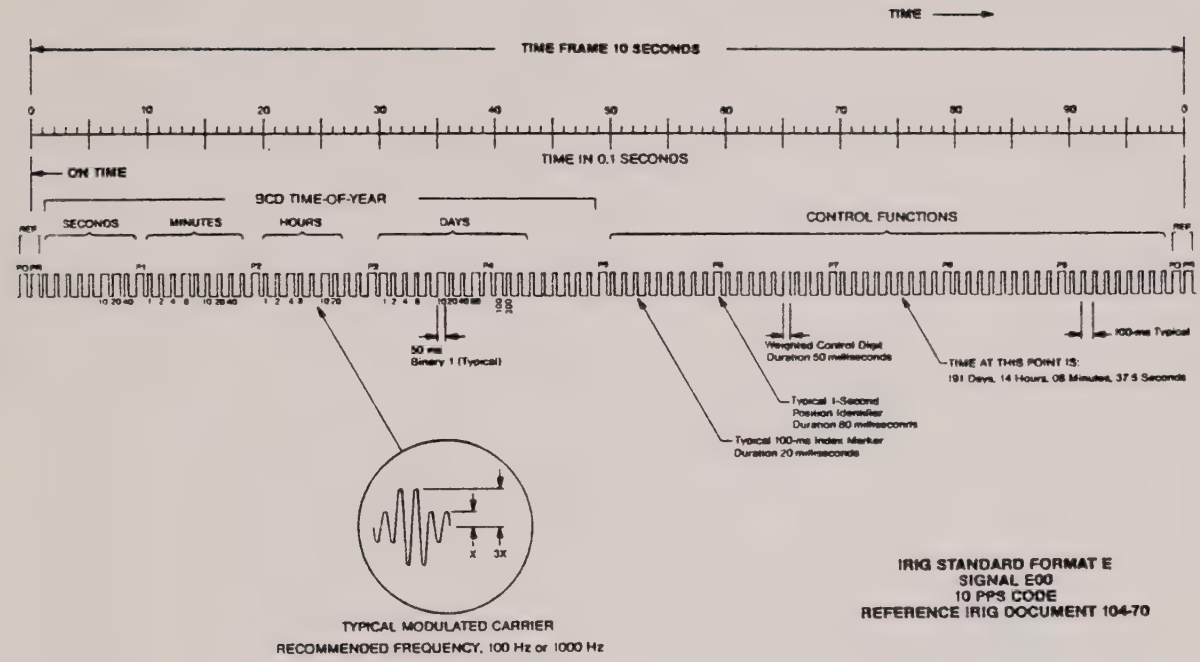


TYPICAL MODULATED CARRIER
RECOMMENDED FREQUENCY, 100 Hz or 1000 Hz

IRIG STANDARD FORMAT D
SIGNAL D00
1 PPM CODE
REFERENCE IRIG DOCUMENT 104-70

1. **TIME FRAME:** 1 hour
2. **CODE DIGIT WEIGHTING OPTIONS:** Binary Coded Decimal Time-of-Year CODE WORD only — 16 binary digits.
   a. Hours and days. Recycles yearly.
3. **CODE WORD STRUCTURE:**
   a. **BCD:** Word begins at INDEX COUNT 20. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS (six for hours; ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 1 per minute (basic Element rate)
   b. 1 per 10 minutes (POSITION IDENTIFIER Rate)
   c. 1 per hour (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each Element is its leading edge.
   b. INDEX MARKER duration: 12 seconds (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 30 seconds (Binary one)
   d. POSITION IDENTIFIER (one per 10 minutes) duration: 48 seconds (Refers to the leading edge of the succeeding Element).
   e. REFERENCE MARKER (one per hour): Two consecutive POSITION IDENTIFIERS.
   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 1 minute (unmodulated); 0.01 seconds (modulated 100 Hz); 0.001 seconds (modulated 1000 Hz)
8. **CARRIER FREQUENCY:** 100 or 1000 Hz when modulated.

IRIG FORMAT 'E' – GENERAL



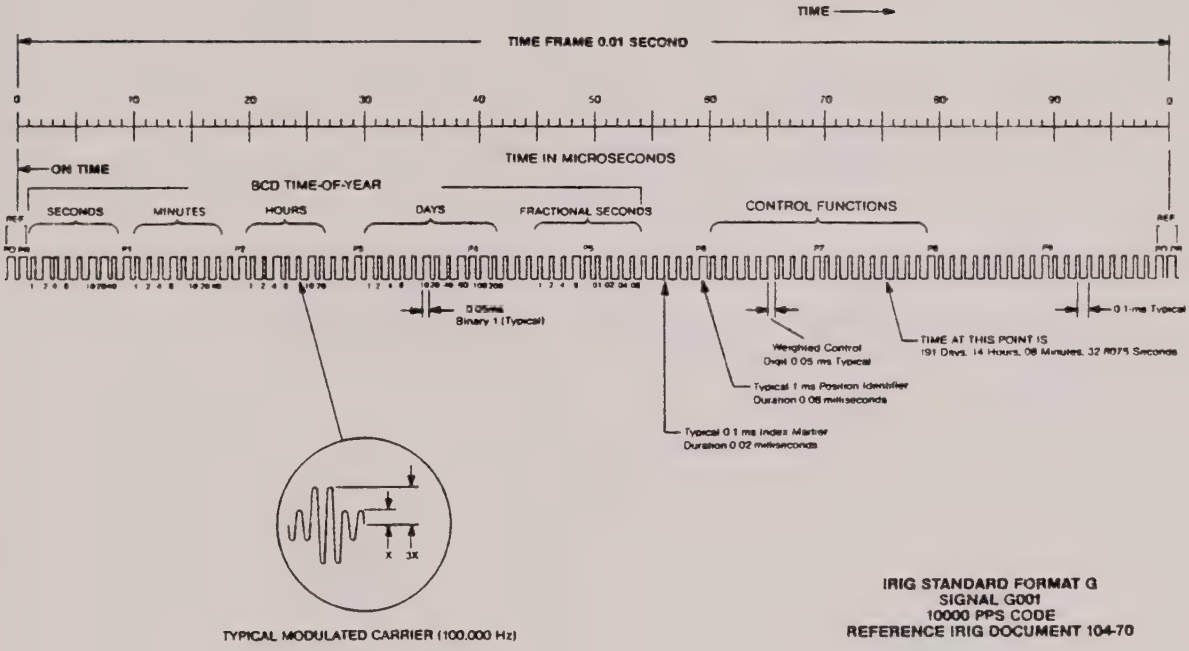
TYPICAL MODULATED CARRIER
RECOMMENDED FREQUENCY, 100 Hz or 1000 Hz

IRIG STANDARD FORMAT E
SIGNAL E00
10 PPS CODE
REFERENCE IRIG DOCUMENT 104-70

1. **TIME FRAME:** 10 seconds
2. **CODE DIGIT WEIGHTING:** BCD: Time-of-Year CODE WORD – 26 Binary Digits. Seconds, minutes, hours and days; recycles yearly.
3. **CODE WORD STRUCTURE:**
   BCD: Word begins at INDEX COUNT 6. Binary-coded Elements occur between POSITION IDENTIFIER ELEMENTS (three for seconds, seven for minutes; six for hours, ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 10 per second (basic Element rate)
   b. 1 per second (POSITION IDENTIFIER Rate)
   c. 0.1 per second (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each Element is its leading edge.
   b. INDEX MARKER duration: 20 milliseconds (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 50 milliseconds (Binary one)
   d. POSITION IDENTIFIER duration: 80 milliseconds (Refers to the leading edge of the succeeding Element).
   e. REFERENCE MARKER (one per 10 seconds): Two consecutive POSITION IDENTIFIERS.

   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 100 milliseconds (unmodulated); 1 millisecond (modulated).
8. **CARRIER FREQUENCY:** 1 kHz or 100 Hz when modulated.

IRIG FORMAT 'G' — GENERAL

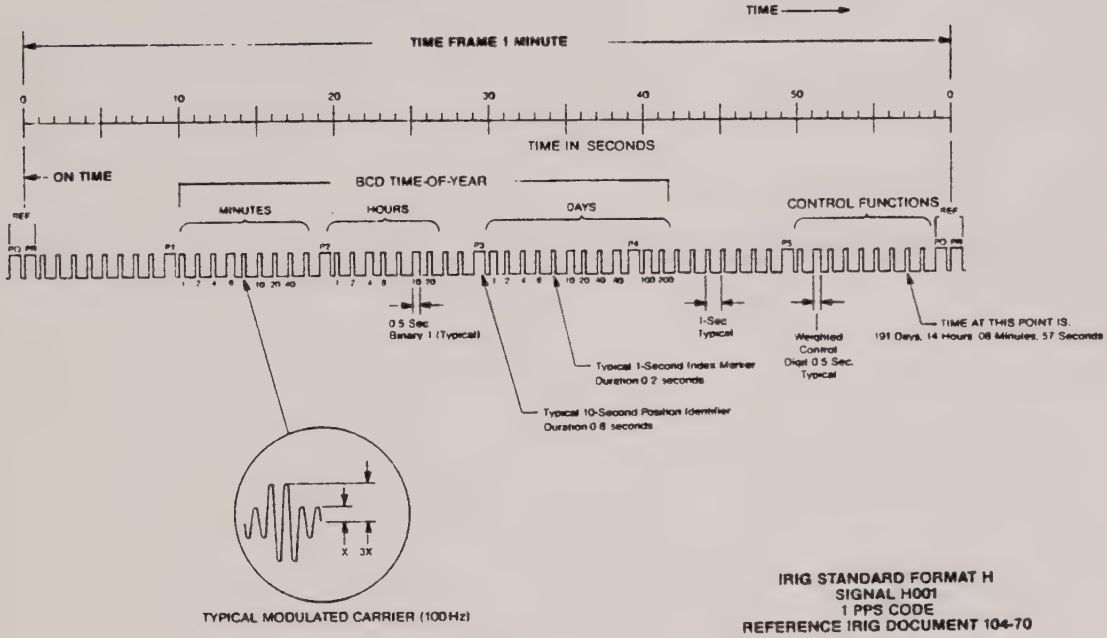


TYPICAL MODULATED CARRIER (100,000 Hz)

IRIG STANDARD FORMAT G
SIGNAL G001
10000 PPS CODE
REFERENCE IRIG DOCUMENT 104-70

1. **TIME FRAME:** 0.01 second.
2. **CODE DIGIT WEIGHTING:** BCD Time-of-Year CODE WORD — 38 binary digits.
   a. Seconds, minutes, hours, days, 0.1 seconds and 0.01 seconds; recycles yearly.
3. **CODE WORD STRUCTURE:** BCD Word begins at INDEX COUNT 1. Binary Coded Elements occur between POSITION IDENTIFIER ELEMENTS (seven for seconds; seven for minutes; six for hours; ten for days; four for 0.1 seconds; four for 0.01 seconds) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first, except for fractional seconds information, which occurs following the Day-of-Year information.
5. **ELEMENT RATES AVAILABLE:**
   a. 10000 per second (basic Element Rate)
   b. 1000 per second (POSITION IDENTIFIER Rate)
   c. 100 per second (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each element is its leading edge.
   b. INDEX MARKER duration: 0.02 milliseconds (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 0.05 milliseconds (Binary one)
   d. POSITION IDENTIFIER duration: 0.08 milliseconds
   e. REFERENCE MARKER: Two consecutive POSITION IDENTIFIERS.
   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 0.10 milliseconds (unmodulated); 0.01 milliseconds (modulated).
8. **CARRIER FREQUENCY:** 100 kHz when modulated.

IRIG FORMAT 'H' – GENERAL

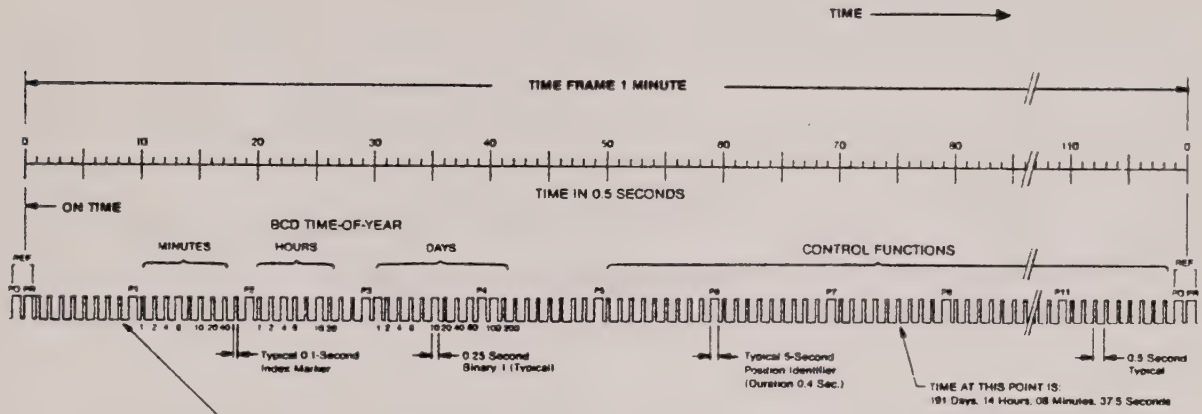


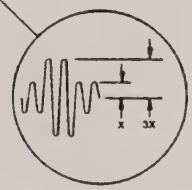
TYPICAL MODULATED CARRIER (100 Hz)

IRIG STANDARD FORMAT H
SIGNAL H001
1 PPS CODE
REFERENCE IRIG DOCUMENT 104-70

1. **TIME FRAME:** 1 minute
2. **CODE DIGIT WEIGHTING:** BCD Time-of-Year CODE WORD – 23 binary digits. Minutes, hours and days; recycles yearly.
3. **CODE WORD STRUCTURE:** BCD word begins at INDEX COUNT 10. Binary-Coded Elements occur between POSITION IDENTIFIER ELEMENTS (seven for minutes; six for hours; ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 1 per second (basic Element Rate)
   b. 1 per ten seconds (POSITION IDENTIFIER Rate)
   c. 1 per minute (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each element is its leading edge.
   b. INDEX MARKER duration: 0.2 seconds (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 0.5 seconds (Binary one)
   d. POSITION IDENTIFIER duration: 0.8 seconds
   e. REFERENCE MARKER: 1 per minute. Two consecutive POSITION IDENTIFIERS (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 1 second (unmodulated); 0.01 seconds (modulated 100 Hz); 0.001 seconds (modulated 100 Hz).
8. **CARRIER FREQUENCY:** 1 kHz or 100 Hz where modulated.

IRIG FORMAT 'C' — GENERAL (OBSOLETE) HISTORICAL



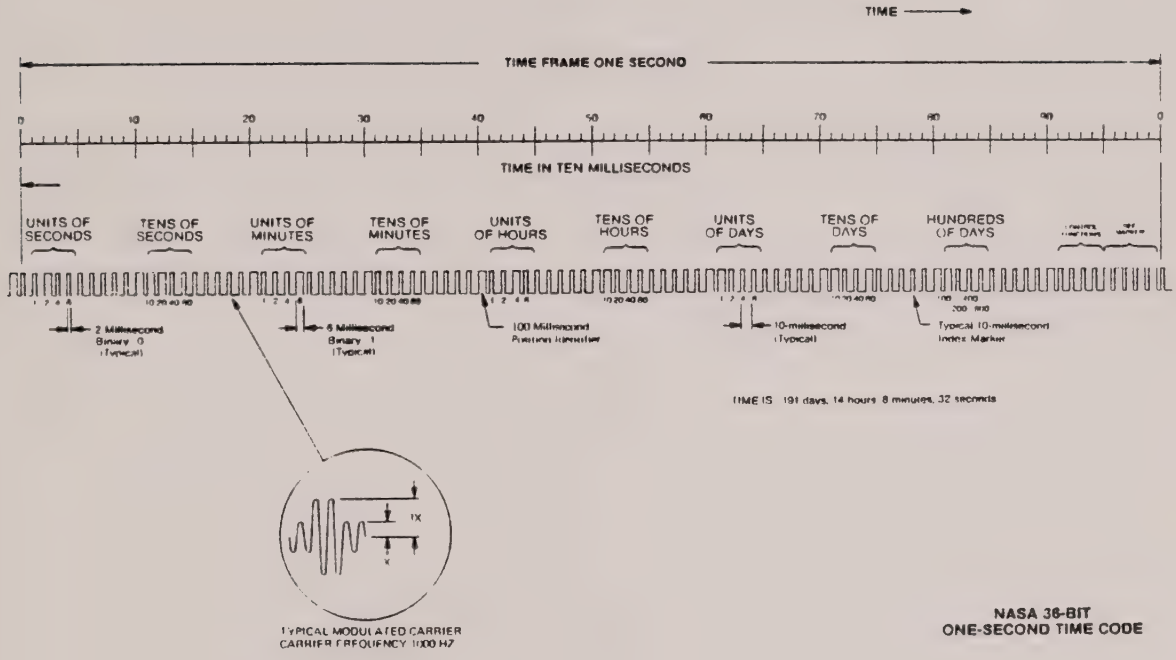


TYPICAL MODULATED CARRIER
(RECOMMENDED FREQUENCY 1000 Hz or 100 Hz)

IRIG STANDARD FORMAT C
2 PPS CODE
(DISCONTINUED)
REFERENCE IRIG DOCUMENT 104-60

1. **TIME FRAME:** 1 minute
2. **CODE DIGIT WEIGHTING OPTIONS:** Binary Coded Decimal Time-of-Year CODE WORD only — 23 binary digits. Minutes, hours and days; recycles yearly.
3. **CODE WORD STRUCTURE:** BCD: Word begins at INDEX COUNT 10. Binary-coded Elements occur between POSITION IDENTIFIER Elements (seven for minutes; six for hours; ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 2 per second (basic Element rate)
   b. 1 per 5 seconds (POSITION IDENTIFIER Rate)
   c. 1 per minute (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each Element is its leading edge.
   b. INDEX MARKER duration: 0.1 seconds (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 0.25 seconds (Binary one)
   d. POSITION IDENTIFIER duration: 0.4 seconds (Refers to the leading edge of the succeeding Element)
   e. REFERENCE MARKER: Two consecutive POSITION IDENTIFIERS.
   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 0.5 seconds (unmodulated); 0.01 seconds (modulated 100 Hz); 0.001 seconds (modulated 1000 Hz).
8. **CARRIER FREQUENCY:** 100 or 1000 Hz when modulated.

NASA 36-BIT TIME CODE (GENERAL)
(NASA 1 SECOND BCD TIME CODE)

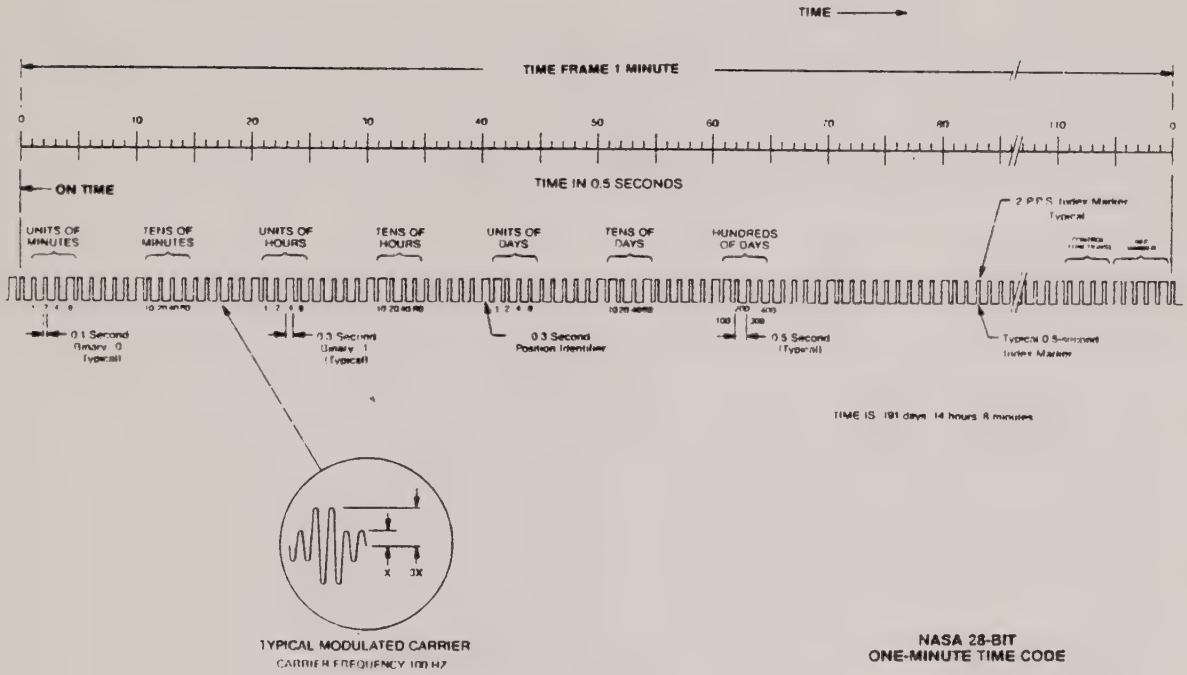


NASA 36-BIT
ONE-SECOND TIME CODE

1. **TIME FRAME:** 1 second
2. **CODE DIGIT WEIGHTING:** Binary Coded Decimal Time-of-Year CODE WORD — 30 binary digits. Seconds, minutes, hours and days; recycles yearly.
3. **CODE WORD STRUCTURE:** BCD: Word begins at INDEX COUNT 1. Binary-Coded Elements occur between POSITION IDENTIFIER ELEMENTS in 4-digit groups until the CODE WORD is complete. A CODE DIGIT occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 100 per second (basic Element Rate)
   b. 1 per second (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each element is its leading edge.
   b. INDEX MARKER duration: 2 milliseconds (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 6 milliseconds (Binary one)
   d. POSITION IDENTIFIER duration: 6 milliseconds
   e. REFERENCE MARKER: Five consecutive POSITION IDENTIFIERS followed by an INDEX MARKER.

   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the INDEX MARKER following the four POSITION IDENTIFIERS.)
7. **RESOLUTION:** 10 milliseconds (unmodulated); 1 millisecond (modulated).
8. **CARRIER FREQUENCY:** 1 kHz when modulated.

NASA 28-BIT TIME CODE (GENERAL)
(NASA 1 MINUTE BCD TIME CODE)

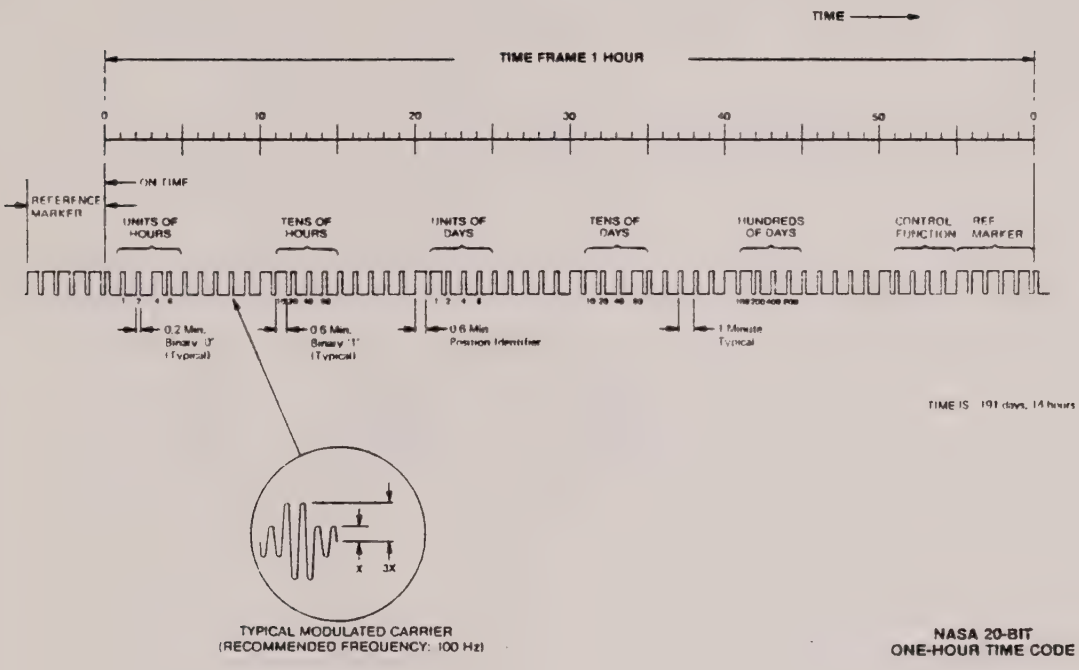


TYPICAL MODULATED CARRIER
CARRIER FREQUENCY 100 HZ

NASA 28-BIT
ONE-MINUTE TIME CODE

1. **TIME FRAME:** 1 minute.
2. **CODE DIGIT WEIGHTING:** Binary Coded Decimal Time-of-Year CODE WORD — 23 binary digits. Minutes, hours and days; recycles yearly.
3. **CODE WORD STRUCTURE:** BCD: Word begins at INDEX COUNT 1. Binary Coded Elements occur between POSITION IDENTIFIER ELEMENTS in four-digit groups until the CODE WORD is complete. A CODE DIGIT occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 2 per second (basic Element Rate)
   b. 1 per minute (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each element is its leading edge.
   b. INDEX MARKER duration: 0.1 second (Binary zero or uncoded Element)
   c. CODE DIGIT duration: 0.3 second (Binary one)
   d. POSITION IDENTIFIER duration: 0.3 second
   e. REFERENCE MARKER: Five consecutive POSITION IDENTIFIERS followed by an INDEX MARKER.
   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the INDEX MARKER following the four POSITION IDENTIFIERS.)
7. **RESOLUTION:** 0.5 second (unmodulated); 0.01 second (modulated 100 Hz); 0.001 second (modulated 1000 Hz).
8. **CARRIER FREQUENCY:** 100 Hz or 1000 Hz when modulated.

NASA 20-BIT TIME CODE (GENERAL)
(NASA 1-HOUR BCD TIME CODE)



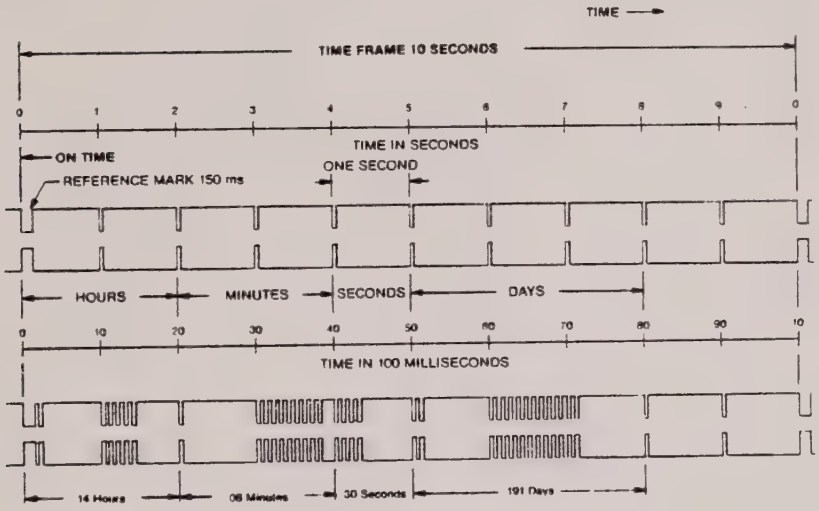
TYPICAL MODULATED CARRIER
(RECOMMENDED FREQUENCY: 100 Hz)

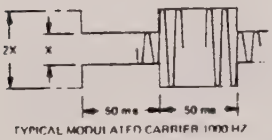
NASA 20-BIT ONE-HOUR TIME CODE

1. **TIME FRAME:** 1 hour.
2. **CODE DIGIT WEIGHTING:** Binary Coded Decimal Time-of-Year CODE WORD — 16 binary digits. Hours and days; recycles yearly.
3. **CODE WORD STRUCTURE:** BCD: Word begins at INDEX COUNT 1. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS in four-digit groups until the CODE WORD is complete. A CODE DIGIT occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 1 per minute (basic Element Rate)
   b. 1 per hour (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each element is its leading edge.
   b. INDEX MARKER duration: 0.2 minutes (binary zero or uncoded Element).
   c. CODE DIGIT duration: 0.6 minutes (Binary One)
   d. POSITION IDENTIFIER duration: 0.6 minutes
   e. REFERENCE MARKER: Five consecutive POSITION IDENTIFIERS followed by an INDEX MARKER

   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the INDEX MARKER following the four POSITION IDENTIFIERS).
7. **RESOLUTION:** 1 minute (unmodulated); 10 milliseconds (modulated 100 Hz); 1 millisecond (modulated 1 kHz)
8. **CARRIER:** 100 Hz or 1 kHz when modulated.

NASA SERIAL DECIMAL — SUPPRESSED CARRIER (GEMINI)



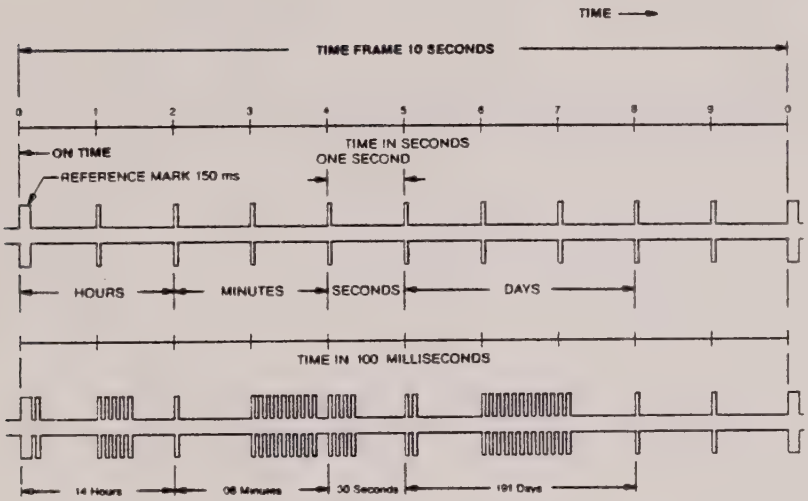


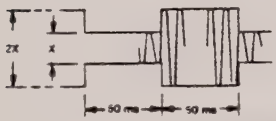
TYPICAL MODULATED CARRIER 1000 HZ

NASA SERIAL DECIMAL CODE — SUPPRESSED CARRIER — (Gemini)

1. **TIME FRAME:** 10 seconds
2. **CODE DIGIT WEIGHTING:** Decimal Time-of-Year CODE WORD. Decimal pulse-coded.
   a. Seconds, minutes, hours and days. A coded pulse is designated by 50 milliseconds of suppressed carrier
3. **CODE WORD STRUCTURE:**
   a. DECIMAL: Word begins at INDEX COUNT 2. Decimal elements occur between POSITION IDENTIFIER ELEMENTS in nine-digit groups until CODE WORD is complete. A Code Digit (50 milliseconds of suppressed carrier) represents one decimal count and is added to accumulate the value of each CODE WORD. An INDEX MARKER occurs between code groups to provide separation for visual resolution.
4. **HOURS CODE WORD:** Occurs first, followed by minutes, seconds and days.
5. **ELEMENT RATES AVAILABLE:**
   a. 1 per second (POSITION IDENTIFIER Rate)
   b. 1 per 10 seconds (Frame Rate)
   All other rates are variable depending on code content.
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each element is its leading edge.
   b. CODE DIGIT duration: 50 milliseconds (decimal count of one)
   c. POSITION IDENTIFIER duration: 50 milliseconds
   d. REFERENCE MARKER duration: 150 milliseconds
   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the 150-millisecond reference occurring at 1 per 10 seconds).
7. **RESOLUTION:** 1 second (POSITION IDENTIFIER); 10 second (Frame Rate); 1 millisecond (Modulated).
8. **CARRIER:** 1 kHz

NASA SERIAL DECIMAL — EXALTED CARRIER (APOLLO)



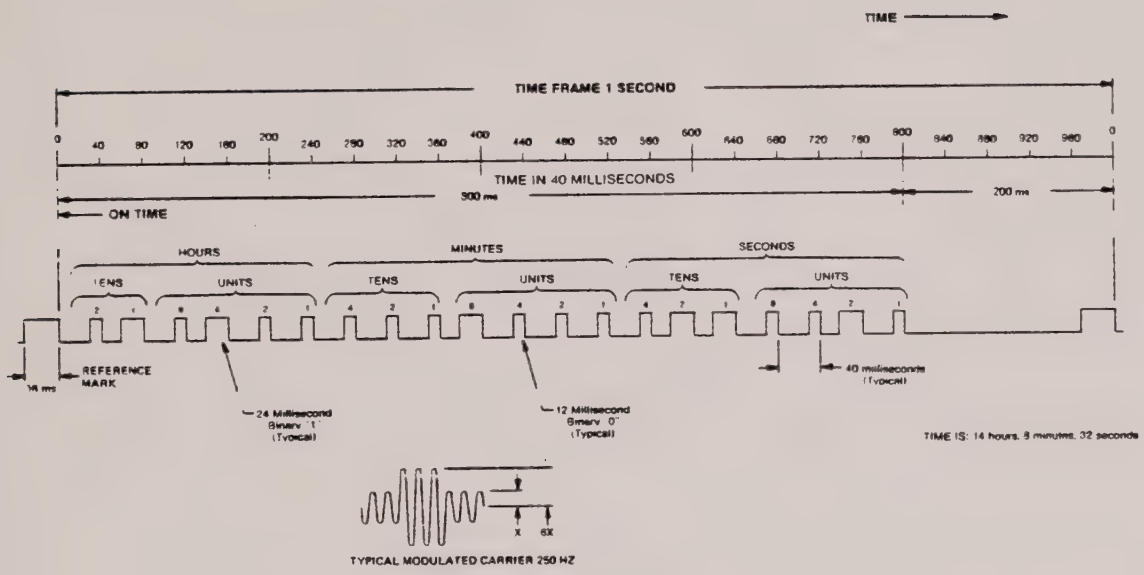


TYPICAL MODULATED CARRIER (1000 Hz)

NASA SERIAL DECIMAL CODE — EXALTED CARRIER — (Apollo)

The Exalted Carrier form of NASA serial decimal Time Code is exactly equal to the Suppressed Carrier format. The only difference lies in the method of modulating the 1000 Hz sinewave.

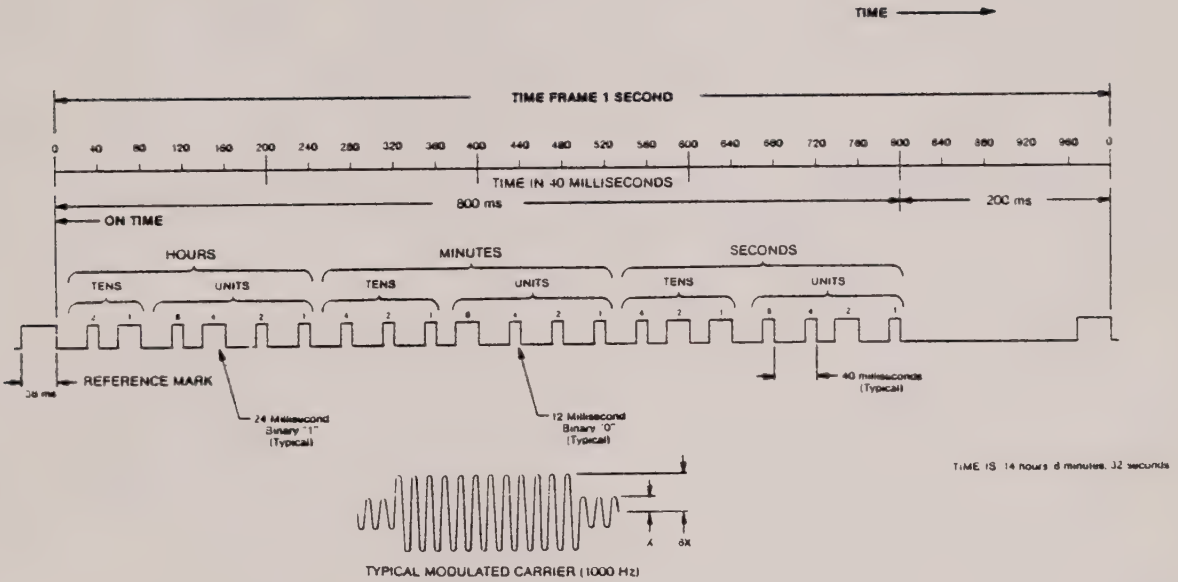
25 PPS — ONE SECOND — 250 Hz
XR3 FORMAT



25 PPS — ONE SECOND TIME CODE (250 Hz - XR3)

1. **TIME FRAME:** 1 second
2. **CODE DIGIT WEIGHTING:** BCD: Time-of-Day CODE WORD — 20 binary digits.
   a. Hours, minutes, seconds. Recycles every 24 hours.
3. **CODE WORD STRUCTURE:** BCD: Word begins at INDEX COUNT 1. Binary-coded Elements occur consecutively (six for hours, seven for minutes, seven for seconds) until the CODE WORD is complete.
4. **MOST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 25 per second (basic Element rate). (Four consecutive pulses missing at end of frame)
   b. 1 per second (Frame rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each Element is its trailing edge.
   b. Binary zero duration: 12 milliseconds
   c. CODE DIGIT duration: 24 milliseconds (Binary one)
   d. REFERENCE MARKER — 1 per second Duration: 36 milliseconds
   (The "On-Time" point, to which the CODE WORD refers, is the trailing edge of the REFERENCE MARKER).
7. **RESOLUTION:** 1 second (Frame Rate) (unmodulated). 40 milliseconds during CODE WORD only 4 milliseconds (modulated).
8. **CARRIER FREQUENCY:** 250 Hz.

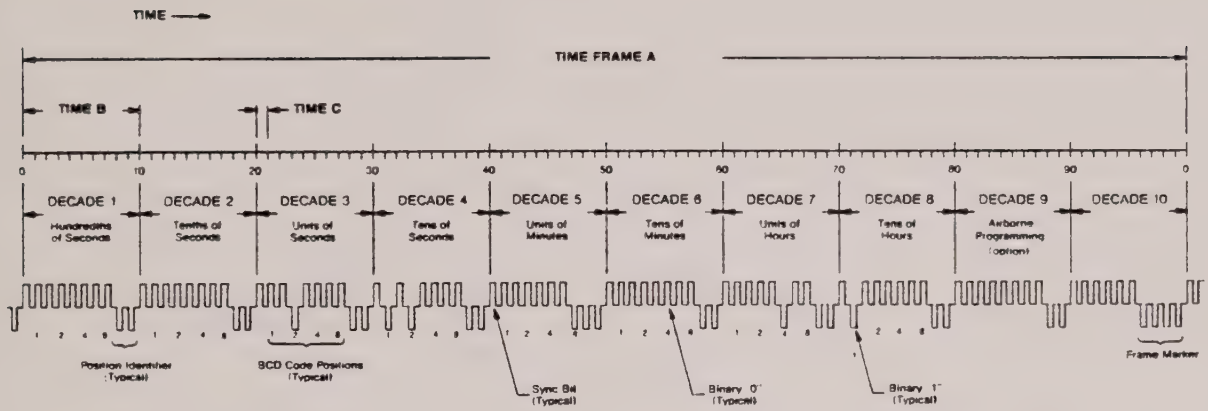
2137 FORMAT



25 PPS — ONE SECOND TIME CODE (1000 Hz - 2137)

The 2137 Format is exactly the same as the XR3 Format. The 2137 Format modulates a 1000 Hz carrier, thus provides a 1 millisecond resolution.

FEDERAL AVIATION ADMINISTRATION — NAFEC
TIME CODES



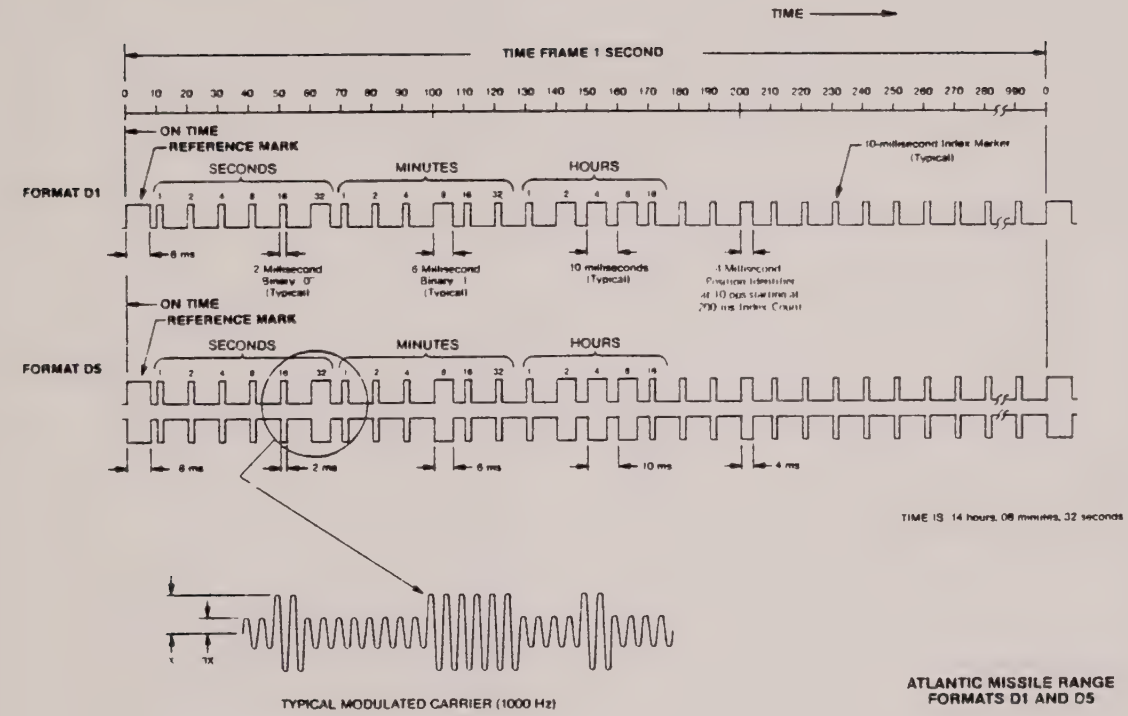
Time Code Frame Rate	TIME		
	A	B	C
1F/10 SEC	10 SEC	1 SEC	100 MS
1F/SEC	1 SEC	100 MS	10 MS
5F/SEC	200 MS	20 MS	2 MS
10F/SEC	100 MS	10 MS	1 MS
20F/SEC	50 MS	5 MS	500 µs

TIME IS: 14 hours 08 minutes 32.00 seconds

FEDERAL AVIATION AGENCY
NAFEC TIME CODE

1. **TIME FRAME:** Any of five from 10 seconds to 50 milliseconds.
2. **CODE DIGIT WEIGHTING:** Binary Coded Decimal Time-of-Day CODE WORD: from 30 binary digits (50 – ms TF) to 18 binary digits (10–second TF).
   a. 0.01 seconds, 0.1 seconds, seconds, minutes and hours; recycles every 24 hours.
3. **CODE WORD STRUCTURE:**
   a. BCD word begins at INDEX COUNT 1. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS until the CODE WORD is complete. An INDEX MARKER occurs between each BCD digit and between each Decimal Group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   Variable from 10 per second (10-second Frame Rate) to 2000 per second (50-ms Frame Rate).
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each element is its leading edge.
   b. INDEX MARKER duration: Variable from 50 milliseconds (10-second Frame) to 250 microseconds (50 ms Frame).
   INDEX MARKER is always positive amplitude (binary zero uncoded Element or Sync Mark).
   c. CODE DIGIT duration: Variable from 50 ms (10-second Frame) to 250 microseconds (50 ms Frame)
   CODE DIGIT is always negative amplitude (binary one).
   d. POSITION IDENTIFIER — same duration as INDEX MARKER — Position Identifier is always two Index Markers and negative in amplitude.
   e. REFERENCE MARKER — four consecutive binary ones followed by an INDEX MARKER (binary zero).
   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the INDEX MARKER following the four consecutive ones)
7. **RESOLUTION:** From 100 milliseconds (10 second Frame) to 500 microseconds (50 millisecond Frame).
8. **CARRIER:** Normally not Carrier modulated.

ATLANTIC MISSILE RANGE
FORMAT D1/D5

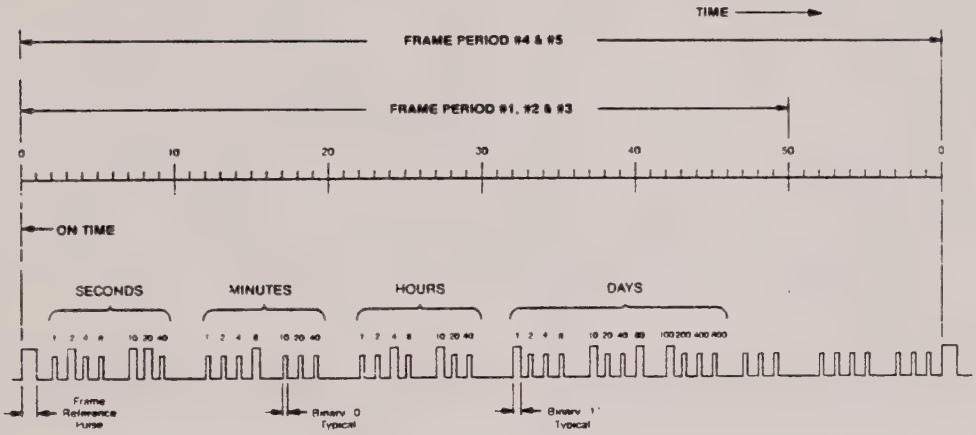

TIME
TIME FRAME 1 SECOND
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 0
ON TIME
REFERENCE MARK
SECONDS
MINUTES
HOURS
10-millisecond Index Marker (Typical)
FORMAT D1
1 2 4 8 16 32
1 2 4 8 16 32
1 2 4 8 16
8 ms
2 Millisecond Binary "0" (Typical)
6 Millisecond Binary "1" (Typical)
10 milliseconds (Typical)
4 Millisecond Position Identifier at 10 pps starting at 290 ms Index Count
ON TIME
REFERENCE MARK
SECONDS
MINUTES
HOURS
FORMAT D5
8 ms
2 ms
6 ms
10 ms
4 ms
TIME IS 14 hours, 08 minutes, 32 seconds

TYPICAL MODULATED CARRIER (1000 Hz)

ATLANTIC MISSILE RANGE FORMATS D1 AND D5

1. **TIME FRAME:** 1 second
2. **CODE DIGIT WEIGHTING:** Grouped Binary Time-of-Day CODE WORD — 17 binary digits.
   a. Seconds, minutes and hours. Recycles every 24 hours.
3. **CODE WORD STRUCTURE:**
   a. Binary word begins at INDEX COUNT 1. Grouped binary elements occur (six for seconds, six for minutes, five for hours) until the CODE WORD is complete.
4. **LEAST SIGNIFICANT DIGIT:** Occurs first.
5. **ELEMENT RATES AVAILABLE:**
   a. 100 per second (basic Element rate)
   b. 10 per second (INDEX MARKER)
   c. 1 per second (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each Element is its leading edge.
   b. INDEX MARKER duration: (100 PPS): 2 milliseconds (Binary zero or uncoded Element)
   c. INDEX MARKER duration: (10 PPS): 4 milliseconds
   d. CODE DIGIT duration: 6 milliseconds (Binary one)
   e. REFERENCE MARKER duration: 8 milliseconds
   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the REFERENCE MARKER).
7. **RESOLUTION:** 10 milliseconds (unmodulated); 1 millisecond (modulated 1 kHz); D5 code
8. **CARRIER FREQUENCY:** 1 kHz — Code designation changed to D5.

DATUM BI-LEVEL SLOW-CODE (5-Rate Selectable)



TIME IS 191 Days 14 Hours 08 Minutes, 32 Seconds

CODE	Pulse Rate	Frame Period	Binary Zero	Binary One	Frame Ref Pulse
1	50 pps	1 Sec	4 ms	10 ms	20 ms
2	10 pps	5 Sec	20 ms	50 ms	100 ms
3	5 pps	10 Sec	40 ms	100 ms	200 ms
4	1 pps	60 Sec	200 ms	500 ms	1000 ms
5	1 p/ 10s	10 Min	2 sec	5 sec	10 sec

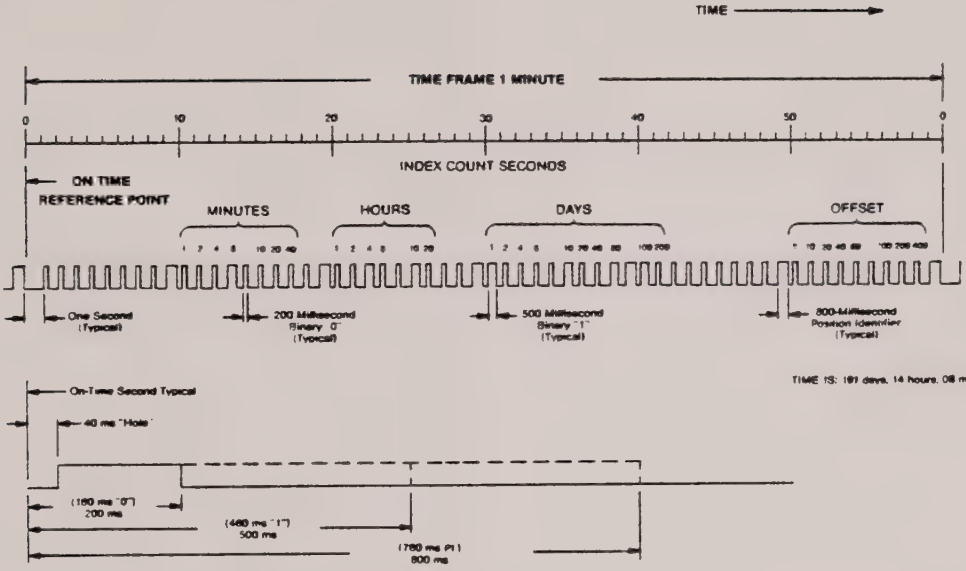
DATUM INC.
BI-LEVEL – 5-RATE
SLOW CODE

The DATUM special Bi-Level Slow-Code is designed to provide a convenient and efficient TIME REFERENCE for strip charts and oscillograph records. Five different and unique codes are provided to enable selection of the desired resolution consistent with the paper speed.

The CODE is width modulated, BCD Format. Amplitude modulation is also added to aid in the separation of the coded information.

Each Code Group is separated by a space to aid in fast recognition of the coded data without loss of resolution or inclusion of extraneous pulses. Coded information represents Time-of-Year in seconds, minutes, hours and days.

WWV/WWVH TIME FORMAT

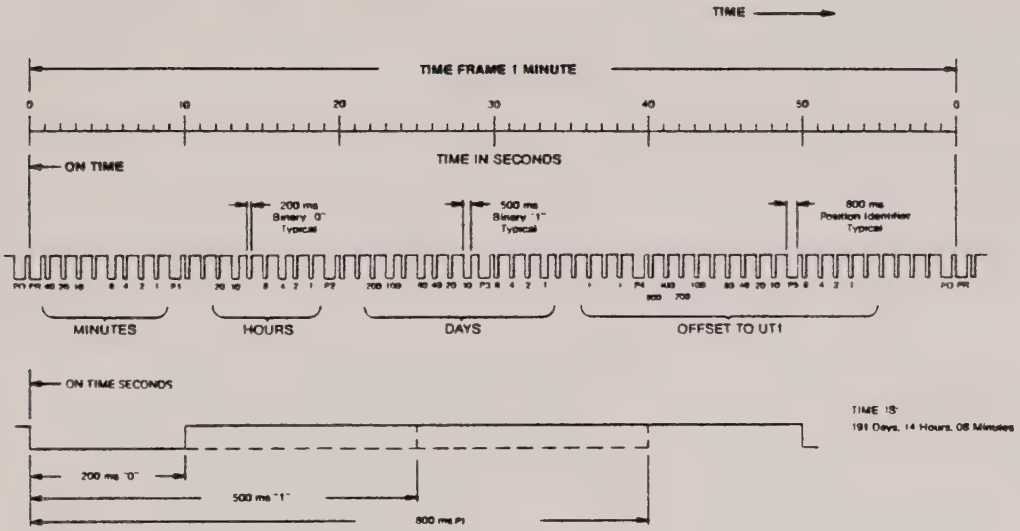


MODULATION: 100 Hz AT 100% MODULATION

NATIONAL BUREAU OF STANDARDS
WWV/WWVH
Standard Time Code Envelope

1. **TIME FRAME:** 1 minute
2. **CODE DIGIT WEIGHTING:** BCD Time-of-Year CODE WORD — 30 binary digits.
   a. Minutes, hours, days and UT correction, 0.01 seconds, 0.1 seconds.
3. **CODE WORD STRUCTURE:** BCD: Word begins at INDEX COUNT 10 + 40 milliseconds. Binary-coded Elements occur between POSITION IDENTIFIER ELEMENTS (seven for minutes, six for hours, ten for days, seven for UT correction) until the CODE WORD is complete. POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** (Minutes) occurs first — UT correction occurs after days.
5. **ELEMENT RATES AVAILABLE:**
   a. 1 per second (basic ELEMENT rate)
   b. 1 per 10 seconds (POSITION IDENTIFIER Rate)
   c. 1 per minute (Frame Rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each element is 40 milliseconds before the element.
   b. INDEX MARKER duration: 160 milliseconds (Binary zero or uncoded element)
   c. CODE DIGIT duration: 460 milliseconds (Binary one)
   d. POSITION IDENTIFIER duration: 760 milliseconds
   e. REFERENCE MARKER — 1 per minute. One POSITION IDENTIFIER followed by a missing digit position. (The "On-Time" point, to which the CODE WORD refers, is the leading edge of an imaginary (missing) POSITION IDENTIFIER following a POSITION IDENTIFIER).
7. **RESOLUTION:** 1 second (unmodulated); 0.01 second (modulated 100 Hz) (theoretical)
8. **CARRIER:** 100 Hz — 100% modulation
9. **TIME SCALE:** Universal Time Coordinated with coded correction to UT1.

WWVB TIME FORMAT



NATIONAL BUREAU OF STANDARDS
WWVB TIME CODE
ONE-PPS CODE ENVELOPE

1. **TIME FRAME:** 1 minute
2. **CODE DIGIT WEIGHTING:** BCD Time-of-Year CODE WORD — 35 binary digits.
   a. Minutes, hours, days, UT correction 0.1 seconds, 0.01 seconds, 0.001 seconds.
3. **CODE WORD STRUCTURE:** BCD: Word begins at INDEX COUNT 1. Binary coded elements occur between POSITION IDENTIFIER ELEMENTS (seven for minutes, six for hours, ten for days, 12 for UT corrected) fill the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. **LEAST SIGNIFICANT DIGIT:** (Minutes) occurs first — UT correction occurs after days.
5. **ELEMENT RATES AVAILABLE:**
   a. 1 per second (Basic Element Rate)
   b. 1 per 10 seconds (POSITION IDENTIFIER Rate)
   c. 1 per minute (Frame rate)
6. **ELEMENT IDENTIFICATION:**
   a. "On-Time" reference point for each element is its leading edge.
   b. INDEX MARKER duration: 0.2 seconds (Binary zero or uncoded element)
   c. CODE DIGIT duration: 0.5 seconds (Binary one)
   d. POSITION IDENTIFIER duration: 0.8 seconds
   e. REFERENCE MARKER — 1 per minute. Two consecutive POSITION IDENTIFIERS
   (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER).
7. **RESOLUTION:** 1 second (unmodulated)
8. **CARRIER:** 60 kH_Z (1:10 modulation ratio) suppressed carrier.
9. **TIME SCALE:** Universal Time Coordinated with coded correction to UT1

APPENDIX B
OPTIONAL FEATURES

OPTION DESCRIPTION

FAILSAFE

(Assembly 18257/19168)

GENERAL DESCRIPTION

a. This option provides for continuity of outputs when operating as a Time Code Translator, should the input code fall below an adjustable threshold level (failsafe).

b. Actuation of the FAILSAFE switch to the IN position enables the unit to operate in a failsafe mode. When reading (1:1 FWD) and the input signal is lost or falls below the adjustable threshold level the failsafe curcuitry forces the unit into a "generate" mode of operation and the time continues to update from the internal oscillator. When the input signal is reacquired, the unit automatically returns to the "read" mode of operation.

c. The FAILSAFE switch should be placed in the "out" position when operating at any other frequency than 1 kHz (1:1 FORWARD). However, when properly controlling the unit with the operational Tape Search Control Lines (GO, FWD*, and SEARCH) the unit will be forced into a normal "read" mode of operation and will automatically return to Failsafe Operation during normal forward (PLAYBACK) mode if the FAILSAFE switch is left in the IN position.

FUNCTIONAL DESCRIPTION

FAILSAFE (Assembly 18257/19168)

This logic is enabled/disabled via a front panel switch. The logic may also be disabled if control signals are applied to external lines associated with tape search control functions. For example, if a Tape Search Control Unit (TSCU) is connected to the unit via an optional parallel BCD output and is in high-speed search mode, then the SEARCH control line is low (ground) and the failsafe circuitry is disabled.

The logic contains an activity sensor which monitors the units code input. The Threshold Level Adjustment potentiometer is adjustable from 0 to approximately 4 volts and is set by the user to slice the positive peak amplitude excursions of the incoming code signal. For example, if the input signal 4 volts peak-to-peak, the threshold pot is set to 1 volt in order to slice the signal at the 50% point (1 volt equals one-half of the positive peak voltage, which is 2 volts).

OPERATION

a. Connect the code to the units code input connector (1:1 FWD).

b. Set the INPUT switches to FWD and +.

c. Set the FILTER switch to IN.

d. Set the FAILSAFE switch to IN.

e. The external tape search controls (FWD*, GO, and $\overline{\text{SEARCH}}$) on connector J4 (pins 45, 47 and 49) must remain in the high (logic "1") state. (i.e., if the parallel BCD output option is installed and a tape search control unit (TSCU) is connected to the outputs, the TSCU must be placed in the forward PLAYBACK mode).

f. Set the BYPASS switch for 8 frame bypass.

PARALLEL OUTPUT OPTION (30)

Assembly 16635

GENERAL DESCRIPTION

Provides non-inverted, buffered BCD outputs of the contents of the major and/or minor time counters, along with a strobe pulse for data sampling purposes. Also provides the input/outut lines necessary for control of the Time Code Translator during tape search operation. Data supplied in a specific instrument is identified by "dash numbers" included in the pin assignment tables. Refer to the List of Materials of this manual to determine the "dash number" configuration supplied with this instrument.

SPECIFICATIONS

a. (J4) 44 bit BCD time of year (milliseconds, S, M, H, D)

b. (J5) 32 bit time of year (S, M, H, D)

c. Output Levels: Logic "0": +0.2V 0.2VDC
Logic "1": +3.7V 1.3VDC

d. Output Characteristics: Each output is capable of supplying up to ten (10) standard TTL loads.

e. Sample Time: Normally a logical "1", pulsing to a logical "0" for approximately 1.5 microseconds at the LSB update. Data outputs are invalid during the time this output is at a logical "0".

CONNECTOR PIN ASSIGNMENTS

See Table 1 for J4 pin assignments. Pin Assignments for J5 are located in Table 2.

TAPE SEARCH OPERATION (Optional)

This option enables the TCG/T to be employed in a tape search system.

a. Connect TCG/T to Tape Search Unit as described in Tape Search Unit instruction manual.

b. Set FWD/REV switch to FWD position. Set FILTER switch to IN position.

c. A logic 1 on Pin 45 of connector J4 programs unit forward operation; reverse operation is programmed by a logic 0.

d. A logic 1 on Pin 49 of connector J4 activates low pass filter; a logic 0 deactivates filter.

e. A logic 0 on Pin 47 of connector J4 inhibits updating of TCG/T.

Table 1. Connector J4 Pin Assignments - Parallel Outputs

Pin	Term		Pin	Term	
1	mS1		26	M40	
2	mS2		27	H1	
3	mS4		28	H2	
4	mS8		29	H4	-2
5	mS10		30	H8	
6	mS20	-3	31	H10	
7	mS40		32	H20	
8	mS80		33	D1	
9	mS100		34	D2	
10	mS200		35	D4	
11	mS400		36	D8	
12	mS800		37	D10	
13	S1		38	D20	-1
14	S2		39	D40	
15	S4		40	D80	
16	S8		41	D100	
17	S10		42	D200	
18	S20	-2	43	D400	
19	S40		44	D800	
20	M1		45	FWD*	
21	M2		46	FRP	
22	M4		47	GO	
23	M8		48	SAMPLE TIME 1	
24	M10		49	$\overline{\text{SEARCH}}$	
25	M20		50	SIGNAL GROUND	

Table 2 - Connector J5 Pin Assignments - Parallel Outputs

Pin	Term		Pin	Term	
1	S1	-4	19	H10	-4
2	S2		20	H20	
3	S4		21	D1	-5
4	S8		22	D2	
5	S10		23	D4	
6	S20		24	D8	
7	S40		25	D10	
8	M1		26	D20	
9	M2		27	D40	
10	M4		28	D80	
11	M8		29	D100	
12	M10		30	D200	
13	M20		31	D400	
14	M40		32	D800	
15	H1		33		
16	H2		34	SAMPLE TIME 2	
17	H4		35	SIGNAL GROUND	
18	H8		36	SIGNAL GROUND	

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